Global Deployment Analysis System Algorithm Description (with Updates)

By
Noetics, Inc.

For
U.S. Army Concepts Analysis Agency

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This Algorithm Description for the Global Deployment Analysis System (GDAS) was prepared by Noetics, Inc. for the U.S. Army Concepts Analysis Agency (CAA) under Contract Numbers MDA903-93-C-0259, DASW01-94-C-0170, DASW01-95-N-5536, and DASW01-97-D-0126 with the Defense Supply Service Washington (DSS-W). The Contracting Officer Technical Representative is Dr. Elizabeth Abbe of CAA, who is also the principal functional sponsor and tester of GDAS. Questions about the GDAS should be referred to her at the following address:

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GDAS for DOS uses the Paradox Database Management System under a sub-license agreement for the Paradox Runtime software, which requires the following statement. The Paradox Runtime software is copyrighted by Borland International and is covered by applicable copyright laws. The Runtime may not be copied without permission except as part of the GDAS installation. Borland International is not responsible for any negative effects resulting from the use of Paradox, and any application support for Paradox Runtime will be provided by the GDAS developers, CAA and Noetics Inc., and not by Borland International.

GDAS for Windows has also been developed by Noetics, Inc. with modifications to support the Voluntary Intermodal Sealift Agreement (VISA) under partial funding from USTRANSCOM, the DOT Volpe National Transportation Center, and Stanley Associates, Inc. GDAS for Windows uses Microsoft Access 97 as the database engine, which must be purchased and installed separately. GDAS for Windows can import the scenario data from GDAS for DOS, and both applications share common model code and scheduling algorithms.

Acknowledgements

GDAS could only be developed with the support and hard work of CAA staff and the GDAS programming team. Key management direction was provided by Mr. Daniel Shedlowski, Mr. Frank McKie, and Dr. Elizabeth Abbe of CAA. Testing and review of GDAS was supported by CAA staff including Mr. Jose Imperial, Ms. Nancy Daugherty, Major Ben Herr, Ms. Renee Carlucci, Ms. Vera Hayes, and Ms. Patricia Fleming of CAA. Prior program management and testing were were provided in a previous contract by Stanley Associates, as well as ongoing testing and support on the GDAS for Windows software. The GDAS design, algorithm development, and programming were performed by Dr. Stephen Young, Mr. George Dalton, and Mr. Keith Hall of Noetics, Inc.

1. System Overview

1.1 Document Preview

This document contains the GDAS Algorithm Description. This initial section provides an overview of the GDAS system adapted from the GDAS User Manual. Subsequent sections summarize the data structures and model algorithms that are used in the GDAS software.

1.2 GDAS Summary

GDAS is a software package which performs transportation analysis of large or small scale DOD deployments including mode planning, port selection, routing, scheduling, and simulation. GDAS executes on desktop microcomputers running Microsoft DOS, Windows NT 4 or later, or Windows 95 or later. GDAS incorporates a global transportation network and schedules movements from CONUS origins to intra-theater destinations using intermodal, multi-theater transport by air, land, and sea. GDAS components include integrated database, query, world-map display, chart graphics, scheduling, simulation modeling, analysis tools, and reporting capabilities. Detailed analysis features include tracking of individual ship and aircraft locations, shortest path routing with node constraints for all modes, port facility throughput limitations with queuing, integrated air/sea/motor/rail mode selection, and staging of time-phased movements at intermediate ports. Use of GDAS requires an analyst who is knowledgeable in DOD transportation and can understand the data relationships, but does not require programming expertise.

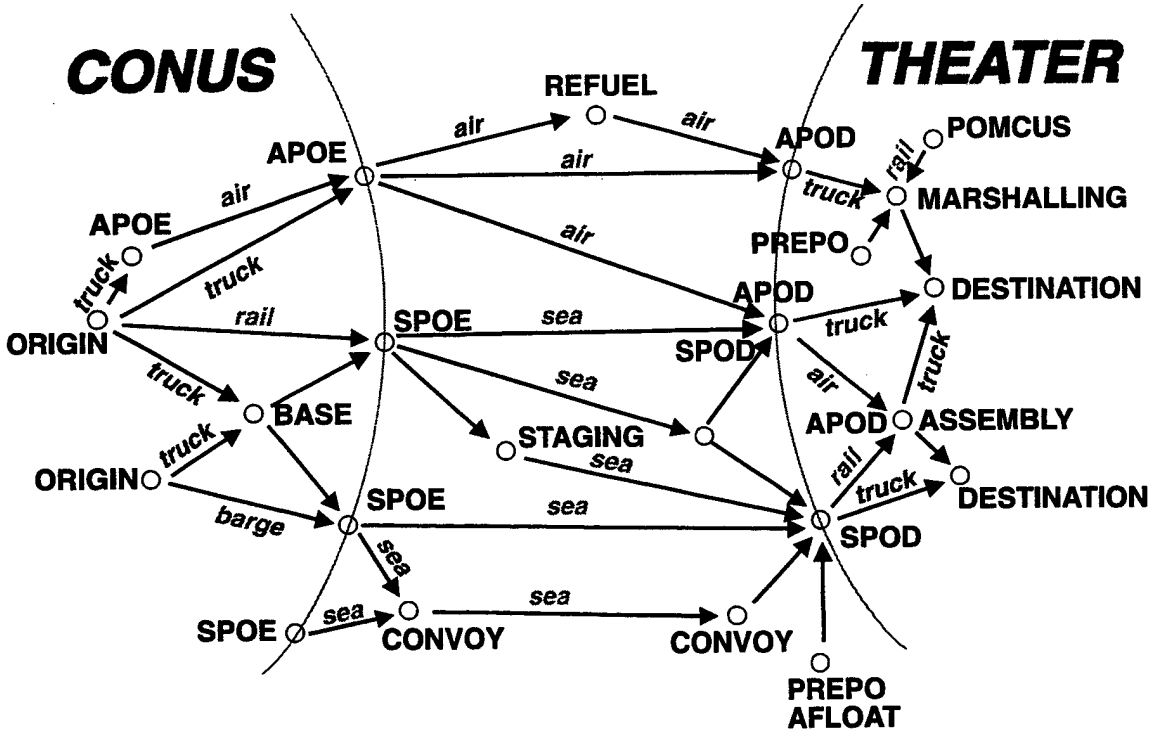


Figure 1-1.Intermodal Transportation Network

Features of GDAS include:

- All modes of transport are treated within a common framework.
- The system provides a framework for testing multiple scheduling algorithms which can be user-selected at runtime for each mode of transport.
- The scheduling algorithms explicitly account for the multi-modal, interdependent nature of DOD transportation, in particular predecessor/successor relationships and staging dependencies.
- The model can run at a high level of detail or a more aggregate level of detail simply by changing data inputs.
- All data is table-driven, including modes of transport, units of measure, vehicle types, vehicle compartments, cargo types, etc. and all of these can be changed in the data without modifying code.
- All model data is input from the database and output to the database, visible to the user.

1.3 Why GDAS was Developed

Because of the importance of DOD mobility, many models have been developed to analyze and simulate various aspects of deployment. These models include MIDAS and JFAST for intertheater air/sea deployment, and SUMMITS and ELIST for intratheater transportation flow analysis. Recently, USTRANSCOM has also developed the Advanced Mobility Platform (AMP),which provides a framework for interfacing with several of these planning models, including export to TPFDD B-8 files which can be processed by GDAS.

Within the context of these other models, GDAS was developed with several objectives:

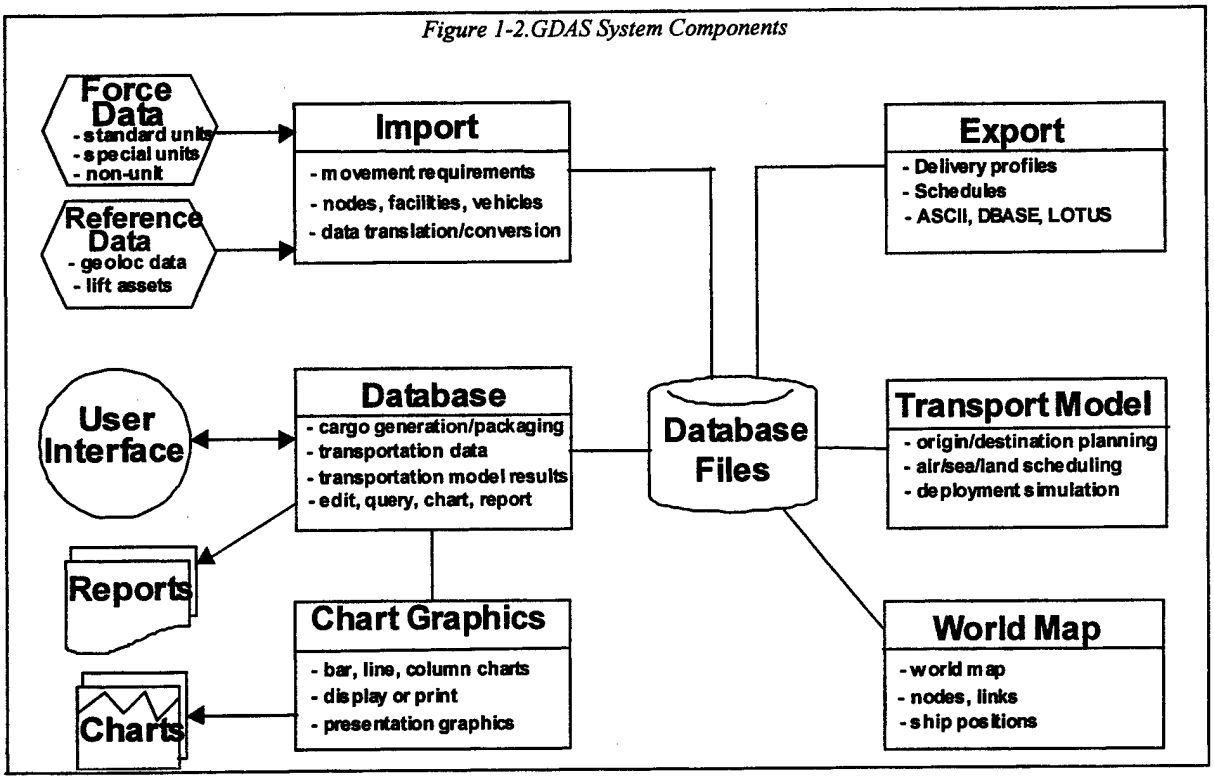
- to perform both intertheater and intratheater mobility analysis within an integrated framework, including mode planning, port selection, staging at intermediate ports, and shared use of resources in combined operations plans;
- to support more detailed analysis of lift assets and facilities, such as scheduling of individual aircraft, tracking of hourly facility constraints, matching of truck/rail cargo constraints, and setup for pre-scheduled cyclical liner routes and preset vehicle itineraries;
- to schedule more realistic, balanced force deployments with proper time-phased delivery of related movements, suitable for input into combat models
- to provide adjustable levels of detail in movement requirements, ranging from aggregate totals for quick studies to individual line item dimensions for detailed analyses;
- to provide fully integrated, end-to-end scheduling, so that bottlenecks in the theater can be identified and alter the planned mode and port selection (POE, POD) prior to shipment from CONUS;
- to provide support for ad-hoc queries and analyses using relational database capabilities;
- to implement large-scale scheduling and simulation algorithms on readily available, portable, and increasingly powerful microcomputer platforms.

GDAS was designed from the beginning to be a highly detailed model for multi-modal scheduling, and simulation from origin to destination. The relational database structures are designed to represent the complete transportation network using common, unified data structures for all modes of transport, including lift assets, vehicle types and compartments, facilities, transportation links, routes, movement requirements with staging and pre-positioning, multiple cargo dimensions and quantity measures, and scheduling time/cost objective functions. By using completely table-driven model inputs, ranging from units of measure to transport modes

and vehicle types, the various algorithms developed for GDAS can be applied to each mode at user-adjustable levels of detail appropriate for the study.

An overview of GDAS system components is provided in Figure 1-2 followed by a summary of the major subsystems.

Figure 1-2.GDAS System Components



1.4 Database Subsystem

The GDAS database subsystem provides view, edit, query, and report capabilities for a full range of transportation data including:

- movement requirements for unit, prepositioned, resupply, staging, and retrograde movements;
- origins, mobilization stations, theaters, and final destinations;
- intermodal transportation network for air, sea, motor, rail, and other modes with node/link constraints;
- aircraft types, compartments, and characteristics;
- individual ships and ship compartment data;
- seaports, berths, and port constraints;
- airports and airport constraints;
- various scenario data such as attrition and convoying;
- detailed scheduling results by vehicle, trip, and stop
- summary results and delivery profiles.

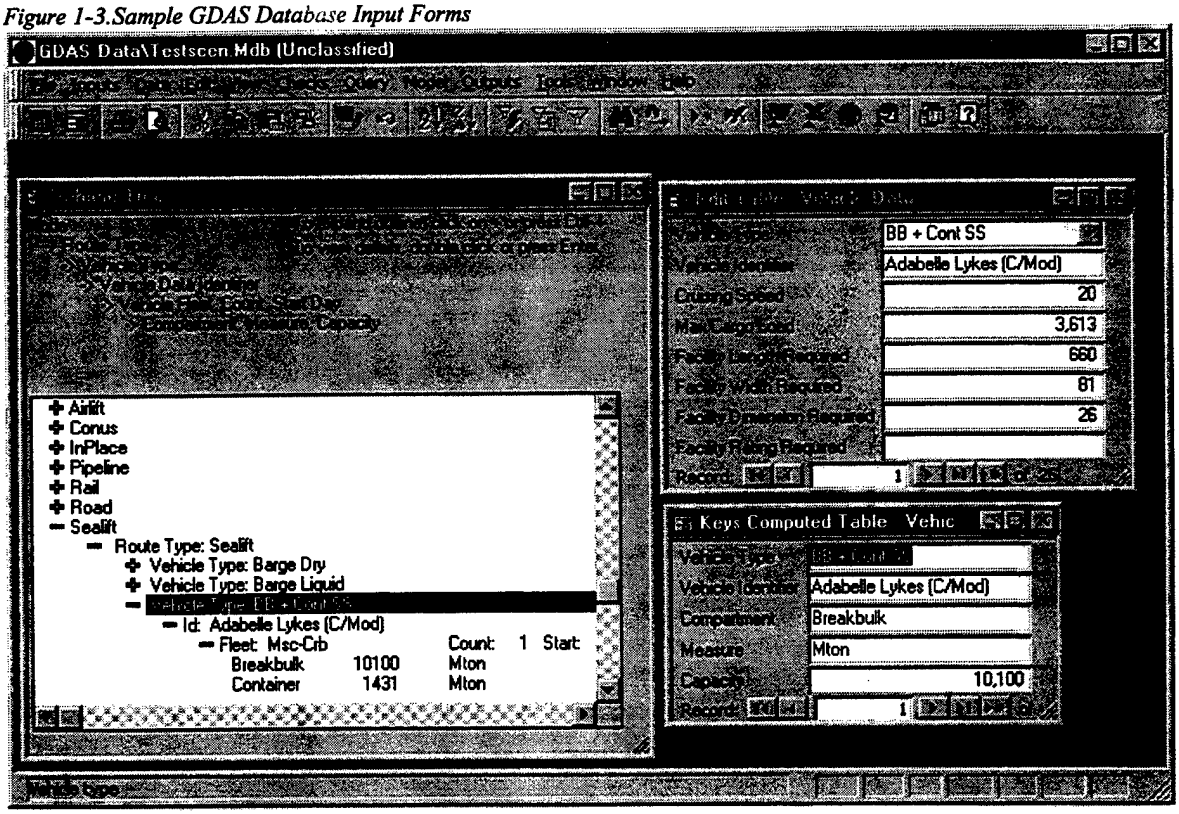
All data is table driven, so it is easy, for example, to define new ship types having an arbitrary number of compartments with individual capacities and units of measure.

Key features of the database include:

- user friendly editing with either tabular views or single record form views of data
- "help and fill" lookup screens for data entry without typing
- comprehensive edit checks at the time of data entry to maintain data quality
- global search and replace for changing large amounts of data
- automatic propagation of data changes to maintain normalized referential integrity
- menu-driven data tables and data entry forms with pick lists and edit checks
- extensive data checking tools (*critically* important for any study!)
- ad-hoc query capabilities with data export
- chart graphics for reports and queries
- output reports, analysis, and query tools.

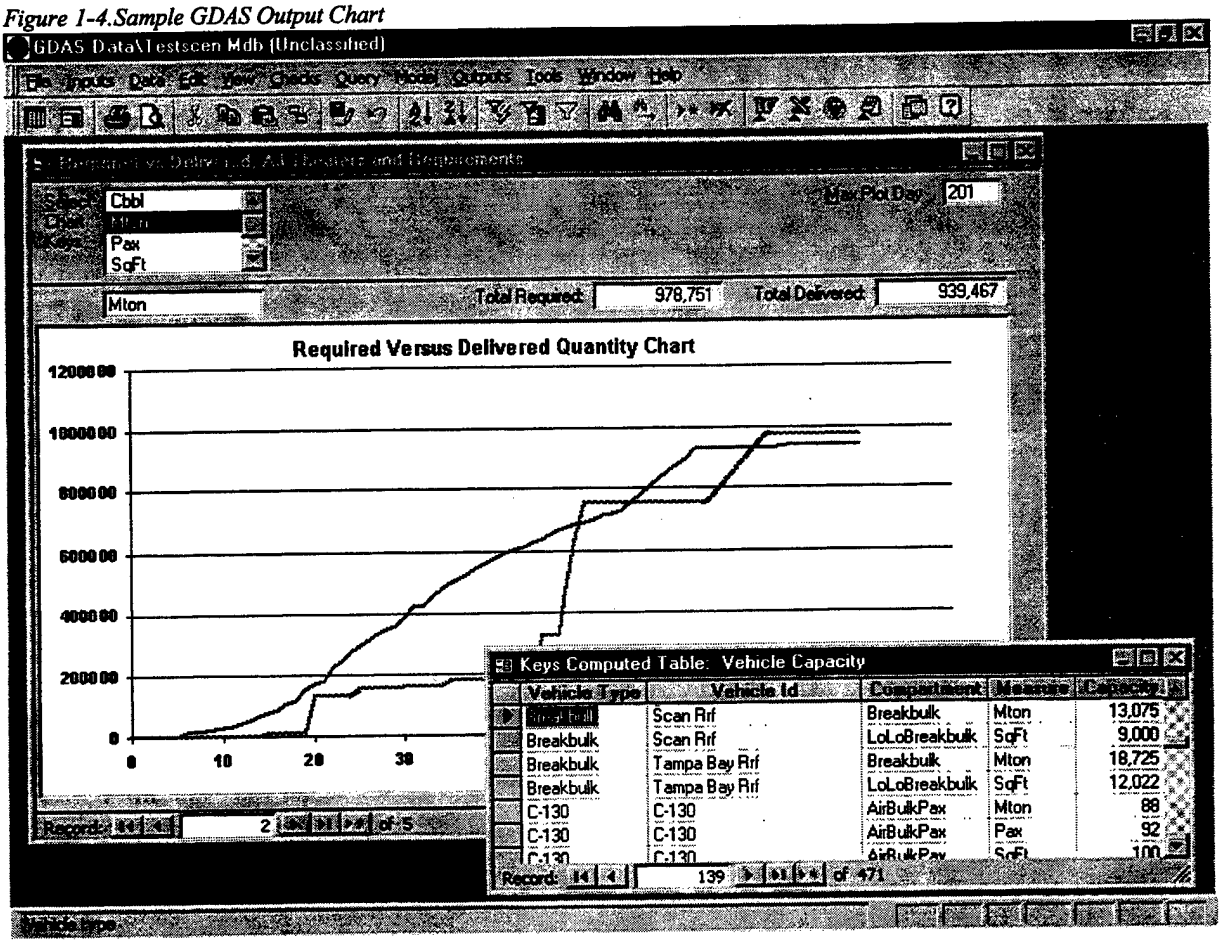
Powerful, but easy-to-use, query capabilities are provided simply by checking the tables/fields desired, with tools to perform automatic multi-table query linking, define record selection criteria with "help and fill", perform Boolean selection and comparisons, provide on-screen or formatted report output, and provide presentation chart graphics (stacked bar, multi-line, area, pie, etc.) on the results of any query.

Figure 1-3.Sample GDAS Database Input Forms



For the DOS version, the database capabilities are implemented using Paradox Runtime for DOS, so that it is not necessary to purchase a commercial database package. For the Windows version, the database is implemented in Microsoft Access 97, which must be purchased and installed separately. The figures display sample data input and chart output forms in the GDAS database.

Figure 1-4.Sample GDAS Output Chart



1.5 Mode Planning and Transportation Scheduling

GDAS scheduling algorithms use a combination of data-driven decision rules, mathematical cost/benefit analyses, dynamic programming, path algorithms, insertion routing, and heuristics in order to plan modes of transport, select ports (POE, POD, intermediate), configure cargo (e.g., for containerization), and schedule individual aircraft, ships, and motor/rail trips. The detailed scheduling model tracks individual trips or sorties for all modes, matches cargo/vehicle/facility constraints, loads separate compartments with multiple capacity measures, and assigns multiple POE/POD trips. Scheduling can also include route insertion with multiple pickups and deliveries per trip, typically used for sealift. In addition, cyclical liner routes and pre-scheduled itineraries can be specified prior to the model run. Simulation techniques are used to generate supply requirements, model facility throughput constraints and queuing at ports, simulate loading and unloading, and calculate travel times.

Because of the large number of decisions to be made, the GDAS strategy is to break the overall scheduling problem into major subproblems, which are then solved iteratively at several levels using optimization and heuristic algorithms based on user-input constraints, decision rules, and cost factors. The major subproblems comprise:

- long-range mode planning, which tentatively assigns ports, modes, fleets, cargo configurations, target lift times, and target delivery times
- mid-term cargo/vehicle *scheduling and routing*, which assigns and schedules (or re-schedules) specific vehicles, trips, stops, facilities, and cargo loads
- current-day *execution and simulation*, which simulates the actual vehicle loading, unloading, facility throughput, facility vehicle handling, queuing, surprise events, etc.

FOR EACH DAY:

PLAN	Assign ports, fleets, modes, cargo configurations, target lift times into future
SCHEDULE	Schedule cargoes and vehicle itineraries forward into the future
SIMULATE	Simulate current hourly loading, facility throughput, queues, travel time, etc.
UPDATE	Update future plans and schedules from simulation, add surprise events
ITERATE	Iterate on planning, scheduling, simulating, and updating

Figure 1-5.GDAS Planning and Scheduling Process

These major subproblems utilize the solutions of other more localized subproblems which are solved separately, including:

- *route insertion* for a candidate cargo assignment in an existing vehicle route
- *vehicle loading* for a candidate cargo onto multiple vehicle compartments
- *port-to-port travel times* with link delays, speed variations, routing constraints, etc.
- *convoying*
- *facility scheduling* with cargo and vehicle handling constraints

1.6 Modeling Level of Detail

All data is table-driven from the database so that the level of detail is adjustable. Movement requirements can be specified as aggregated packages with total short tons; or as more detailed packages with short tons, measurement tons (a unit of volume), and square feet by unit and cargo category; or as individual line items with both quantity measures (tons, square feet, etc.) and dimensional limits (maximum height, etc.).

The typical level of detail used for sealift scheduling includes the following:

- individual ship characteristics, such as speed, draft, length, beam, cargo dead weight capacity
- multiple compartments and capacity measures with stow factors;
- multiple pickups and drop-offs per trip;
- shortest path calculations with routing constraints for canals;
- detailed seaport facility modeling including constraints on draft, length, beam, available berths, queuing, cargo throughput, load/unload rates;
- matching of ship/compartment/cargo/port compatibility constraints such as hazardous materials or port facilities;
- staging and special missions (Marine amphibious task forces, crane ships, etc.);
- attrition and convoying.

The typical level of detail for airlift, motor, and rail provides for:

- individual aircraft or vehicle tracking by fleet and trip (or flow analysis if desired);
- multiple compartments and capacity measures with stow factors;
- matching of vehicle/compartment/cargo/airport compatibility constraints;
- route selection based on link distances and delays including tradeoffs between refueling stops versus critical leg payloads for aircraft;
- travel time calculations including arrive/depart or takeoff/landing time, enroute refueling stops, cruising speed, link delays, and link speed limits;
- load/offload rates depending on airport facilities;
- throughput at facilities limited by arrival/departure constraints, cargo throughput limits, maximum on ground (MOG) or parking constraints, and fleet restrictions;
- vehicle availability limited by utilization rates and fleet availability.

Because the data structures and level of detail are defined in by "metadata" tables in the system, the amount of detail can be adjusted for each mode of transport as required by the study application.

1.7 Map Graphics

The transportation graphics module provides a world map display with origins, destinations, seaports, airports, and transportation network nodes/links/channels as defined from the database. The graphics provides capabilities to zoom, pan, set display options and layers, and print/plot. In addition, the scheduling model can display vehicle (ship, aircraft, etc.) location snapshots based on the detailed itineraries and the interpolation of routing paths. Currently the map graphics does require the MapInfo commercial package as the underlying graphics engine, although this is not required to use the rest of the GDAS system.

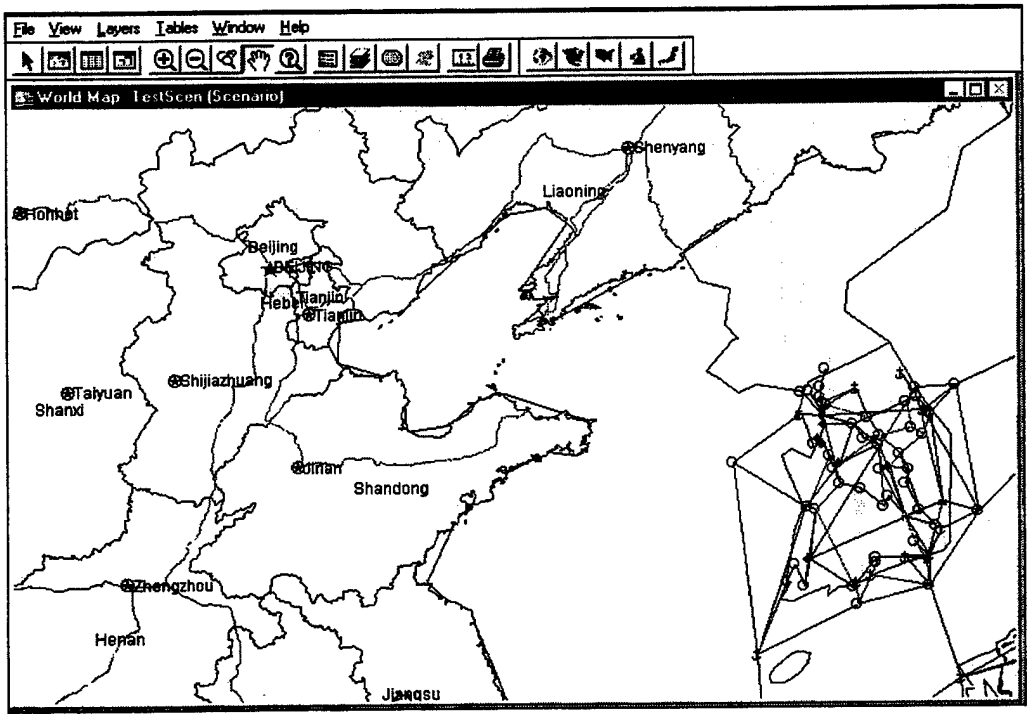


Figure 1-6. World Map Display

1.8 Current Status of GDAS

GDAS is installed at CAA, USTRANSCOM, MARAD, Stanley Associates, and others for use in ongoing studies. The current version of GDAS is a stand-alone system which fully implements planning, scheduling, and simulation for all transport modes from origin to destination. Development of an interface to the USTRANSCOM AMP system has been completed using JOPES B8 TPFDD files. CAA is using GDAS for transportation studies including Korea RSOI (Reception, Staging, and Onward Integration), SRA, and MRS-05 (Mobility Requirements Study for 2005). In addition, GDAS is currently being applied by USTRANSCOM, the DOT Volpe National Transportation Center, and Stanley Associates, Inc. for detailed modeling of the Voluntary Intermodal Sealift Agreement (VISA) between DOD and commercial sealift carriers. GDAS development continues in the areas of handling of surprise events with re-scheduling, data import, and other enhancements. GDAS has been verified by CAA in numerous test scenarios as well as data from Desert Storm and Restore Hope deployments.

2. Overview of Model Algorithms

2.1 Introduction

This Section provides a high-level overview of the modeling approach and algorithms developed for GDAS to plan, schedule, and simulate large-scale multi-modal transportation problems for DOD deployments. The primary objective of the GDAS model is to provide a detailed analysis of transportation capabilities from origin to destination given the movement requirements, the multi-modal transportation network, the available lift assets, the cargo/vehicle handling facilities, and other factors. Alternatively, GDAS can be used to determine the preferred mix and quantity of lift assets needed to meet delivery requirements. In order to evaluate the transportation system, GDAS divides the problem into planning, scheduling, and simulation components and implements algorithms appropriate for each level.

2.2 The DOD Transportation Problem

DOD deployment has unique characteristics that differ from commercial vehicle routing and scheduling applications, namely: large magnitude, high complexity, multi-modal transport, time-phased dependencies, and high time priorities versus cost.

The first characteristic is the magnitude of the problem. For large deployments, the number of scheduled vehicles can range to the tens of thousands (ships, planes, motor vehicles, rail, etc.) each with multiple trips, and the number of separately scheduled cargos can exceed a hundred thousand, each with multiple nodes for origin, destination, intermodal transfer points, and path routing. The time frame generally spans 90 to 200 days. For recent GDAS studies, the underlying transportation network includes about 700 nodes, 2000 node facilities, and 4000 transport links.

In conjunction with the scale of the transportation is complexity. DOD movements encompass all types and sizes of cargo (heavy equipment, passengers, supplies, refrigerated foods and medicines, containers, hazardous materials, ammunition, etc., ranging from personal effects to large armored vehicles), as well as all types of transportation facilities, vehicles, routing links, convoys, and resources, all with constraints on matching, availability, and throughput handling. Many requirements may have pre-assigned missions, staging locations, intermediate ports, sequencing constraints, timing priorities, and other deployment restrictions.

A third characteristic of DOD transportation is the intrinsic multi-modal nature of the deployment. DOD cargos generally move starting from CONUS origins via motor, rail, and pipeline to POEs (ports of embarkation), possibly with consolidation or assembly points; from POEs to PODs (ports of debarkation) via air or sea, possibly with intermediate ports or staging areas; and from PODs into the theater via motor, rail, and air with multiple staging or assembly points. In addition, some movements may start at prepositioned locations in the theater, at sea, or at other locations for earlier delivery, again requiring multiple modes of transport.

A fourth characteristic is the critical nature of time-phased dependencies between different DOD movements. Most of the movement requirements are not interchangeable products. The DOD scheduling process must consider the time-phased coordination of different forces, the cumulative delivery of "balanced" forces, the sequencing of combat/support/resupply movements, the retention of unit integrity, the predecessor/successor relationships of multi-modal movements, and the staging, packaging, and assembly of movements.

Another feature of DOD rapid deployments which is different from many vehicle scheduling applications is that the movements are predominantly uni-directional during the early crisis phases. The movements may travel long distances from CONUS origins to theater destinations, and delivery vehicles may have

nearly empty return trips until much later in the deployment. This characteristic can be used to tune the scheduling algorithms for faster performance on typical DOD problems.

Finally, DOD transportation applications often involve crisis responses with high time priorities and other measures of effectiveness, which may take priority over transportation costs. Nevertheless, cost criteria remain important, including tradeoffs between air and sea, use of fewer lift assets versus timeliness, efficient routing, and full loading where possible.

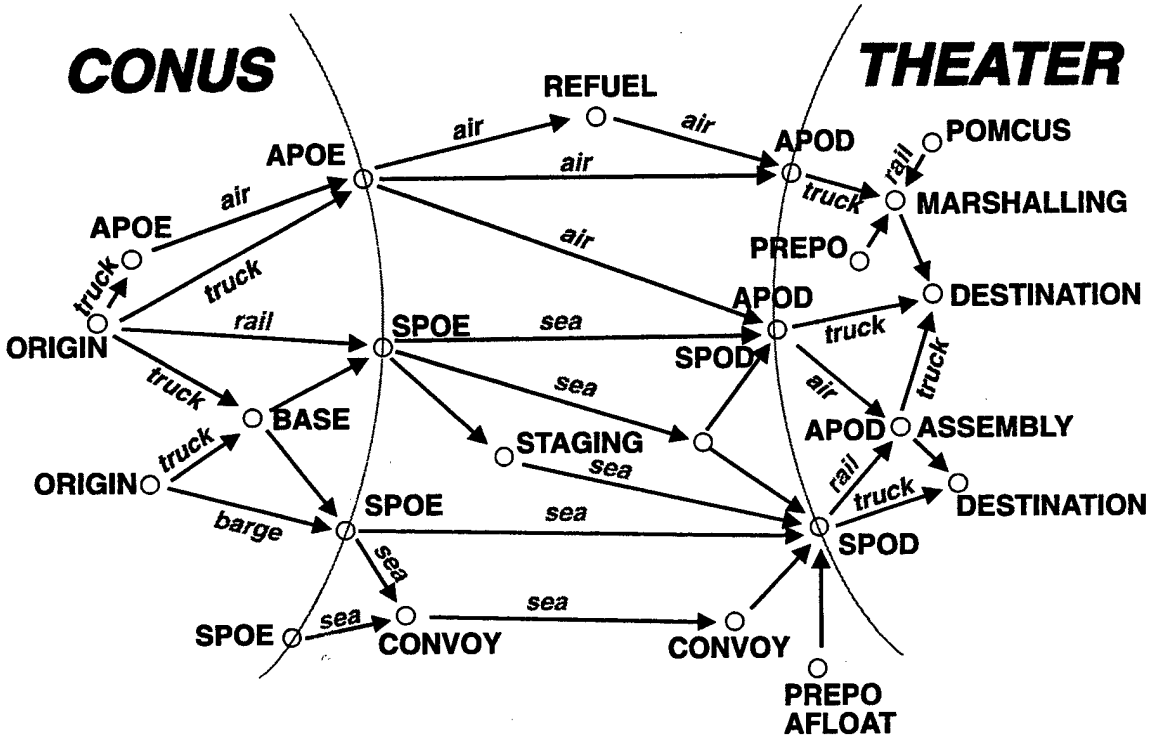


Figure 2-1. Intermodal Transportation Network

2.3 Deployment Planning Models

Because of the importance of DOD mobility, many models have been developed to analyze and simulate various aspects of deployment. Generally, the models can be classified according to the type of scheduling algorithms and the level of detail, ranging from aggregate linear programming with or without time periods, to cargo flow models using cargo quantities, or vehicle flow models allocating vehicle capacities, to individual vehicle scheduling, down to multiple trip scheduling with route insertion and multiple pickups and deliveries. The various models can also be classified by usage—long-range asset or budget planning, mid-range deliberate planning, and short-range execution planning and re-scheduling. The more detailed models generally focus on a single leg of the deployment, either CONUS (origin to POE by truck, rail, and organic), or strategic (POE to POD by air and sea), or intratheater (POD to destination or assembly area). Recently, USTRANSCOM has developed the Advanced Mobility Platform (AMP) to provide a framework for interfacing several planning models including MIDAS (a strategic model from POE to POD with vehicle flows for airlift and individual vehicles for sealift), JFAST (also a strategic model with vehicle flows for airlift and individual ship scheduling), MASS (a detailed airlift simulation model with some scheduling aspects), and ELIST (an intratheater cargo flow model). Although the AMP platform provides an integrating framework, the individual models are not fully integrated and have different data structures and inputs.

2.4 GDAS Overview and Data Structures

GDAS was designed from the beginning to be a highly detailed model for multi-modal planning, scheduling, and simulation from origin to destination encompassing all modes of transport. Figure 2-1 provides a conceptual overview of the intermodal transportation network. The relational database structures are designed to represent the complete transportation network from origin to destination using common, unified data structures for all modes of transport, including lift assets, vehicle types and compartments, facilities, transportation links, routes, movement requirements with staging and prepositioning, multiple cargo dimensions and quantity measures, and scheduling time/cost objective functions. Major data inputs are listed in Figure 2-2.

Figure 2-2. Basic Transportation Data Inputs

- Movement Requirements
- Origins, destinations, cargo categories, quantities, dimensions, time windows (read to load day, required delivery day, earliest delivery day)
- Transportation Network
- Transport modes, nodes, links, facilities, capacities, constraints
- Transport Vehicles
- Vehicles, capacities, locations, availability, characteristics
- Loading Data
- Load/unload rates, stow factors, cargo/vehicle/facility compatibility rules, cargo dimension restrictions

The database and scheduling algorithms are structured to be completely data-driven, from units of measure to transport modes and vehicle types. This permits the various scheduling algorithms in GDAS to be applied to each mode at user-adjustable levels of detail.

2.5 GDAS Scheduling Algorithms

Because of the large problem size, the GDAS strategy is to decompose the overall scheduling problem into interrelated subproblems that are solved iteratively at several levels using optimization and heuristic algorithms based on user input constraints, decision rules, and cost factors. At a high level, decision algorithms examine tradeoffs between multiple cargos and vehicles, operating in phases at an increasing level of detail, with increasingly firm decisions about the scheduling. The high level algorithms are:

- long-range **transportation planning**, which assigns ports, modes, planning fleets, cargo configurations, and target lift times, but *not* individual lift asset vehicles such as ships or planes
- mid-term **cargo/vehicle scheduling**, which assigns, sequences, and schedules (or re-schedules) specific vehicles, trips, stops, facilities, and cargo loads
- event-driven hourly **simulation**, which simulates the actual vehicle loading, unloading, facility throughput, facility vehicle handling, queuing, surprise events, etc.

The high level algorithms listed above utilize the solutions of other more localized subproblems which are solved separately with a narrow focus. These localized decision-making sub-algorithms include:

- **route insertion** for a candidate cargo assignment and insertion into an existing vehicle route
- **cargo loading** for a candidate cargo onto multiple vehicle compartments
- **port-to-port travel times** with link delays, payload variations, speed limits, route constraints, etc.

- **convoying**
- **capacity event scheduling** for facilities and nodes with cargo and vehicle handling constraints

Effective scheduling is a difficult problem, even on a small scale. By iteratively evaluating the major subproblems and efficiently solving smaller subproblems, the GDAS strategy is similar to that of human schedulers. It should be noted that human schedulers perform quite well on small-scale problems, particularly in resolving special situations and balancing competing objectives. GDAS cannot globally optimize the scheduling, but rather attempts to match the human scheduling ability on small problems and then applies this process consistently on a larger scale.

FOR EACH DAY:

PLAN	Assign ports, fleets, modes, cargo configurations, target lift times into future
SCHEDULE	Schedule cargoes and vehicle itineraries forward into the future
SIMULATE	Simulate current hourly loading, facility throughput, queues, travel time, etc.
UPDATE	Update future plans and schedules from simulation, add surprise events
ITERATE	Iterate on planning, scheduling, simulating, and updating

Figure 2-3. GDAS Transportation Planning and Scheduling Process

GDAS begins with an initial long-term transportation planning from origin to destination. After the initial planning, daily iterations are performed consisting of mid-term scheduling and re-scheduling using detailed route insertion, long-term planning and re-planning, and detailed current-time event simulation, as shown in

Figure 2-3. The high level algorithms and the localized subproblem algorithms are summarized in the paragraphs below. Additional details are provided in later sections.

2.6 *High Level Algorithms*

2.6.1 Transportation Planning

The transportation planning algorithm determines the preferred transport modes, POEs, PODs, target lift times, and target delivery times for each movement from origin to destination, without specifically assigning individual vehicles. The planning must account for any mode exclusions, required intermediate ports, and cargo/vehicle/facility matching constraints. GDAS uses a dynamic programming formulation for successive transportation planning of each movement requirement, with user-specified cost weightings for travel costs versus lateness. The dynamic programming is implemented using multiple states at each network node to represent all earliest arrive times for each mode of transport, each planning fleet, and each cargo configuration, allowing for changes in mode or planning fleet at each facility. The algorithm is considerably speeded up by calculating upper bounds and lower bounds from the current node states to the destination, enabling a branch and bound technique to prune many of the states. The dynamic programming algorithm itself is somewhat "optimal", in that it considers all transportation network nodes, all mode and fleet changes at POEs/PODs, all cargo configurations, all multi-modal links, and all routes (including convoy routes) for a *single* requirement. However, the underlying time calculations use approximated delays, load/unload times, and planning speeds by vehicle type, without actually assigning individual vehicles, so the state calculations are heuristic. In addition, the algorithm evaluates the movement requirements successively with an approximate look-ahead to evaluate interference effects on later cargos, so that joint vehicle and facility tradeoffs are evaluated in a moving time frame rather than all alternatives. Thus, the dynamic programming is used iteratively as a heuristic optimization technique—the transportation planning generates plans with tentative ports and target lift times, rather than detailed schedules. The actual assignment of vehicles, trips, stops, and loads is determined later in the scheduling algorithm.

One of the difficulties encountered in transportation planning is that the matching constraints between cargo types, facility capabilities, and individual transport vehicles can be very restrictive. In some cases, very few vehicles may actually be feasible for a candidate lift assignment, even though the cargo/facility/vehicle types appear to be compatible. Examples include shallow-draft seaports that exclude nearly every tanker, or airports with short runways. In addition, the planning of such movement requirements can strongly affect the availability of lift assets and facilities for other movement requirements. As a result, the transportation planning has since been extended (beyond its original intent) to evaluate individual vehicle and facility constraints and availabilities, even though the vehicle assignments are completely re-evaluated later during scheduling.

A complete transportation planning analysis is an important first step in GDAS and can consume half the run time, particularly if ports and transport modes are not pre-specified. The results represent a "cargo flow" view of the entire plan. Most of the results, however, are thrown away and only the initial transport legs are retained for subsequent scheduling, without retaining the subsequent mode/port assignments or successor legs. Later, re-planning of successor cargos to their destinations is performed on a daily basis as the detailed scheduling algorithm progresses, again retaining only the immediate successor legs. This daily re-planning approach is able to respond to the latest scheduling and simulation results, so that the preliminary planning results may be revised significantly during later time frames.

2.6.2 Cargo/Vehicle Scheduling

The vehicle scheduling algorithms are invoked each day to assign planned cargos to specific vehicles. The scheduling is limited to mid-term cargos with target lift times falling within a rolling time horizon. The vehicle scheduling output consists of updated vehicle routes and schedules, including multiple trips, pickup and delivery stops, cargo manifests, and compartment load quantities. Currently, GDAS has four scheduling models at various levels of detail:

- a quick *travel time* algorithm, which matches vehicle characteristics with cargos and facilities and estimate travel times with unconstrained vehicle availability
- a *vehicle flow* model which allocates vehicle hours based on round trip time calculations (comparable to the MIDAS and JFAST airlift models)
- a more detailed *pickup/delivery* scheduling algorithm which performs cost-based assignments of cargos to successive trips allowing multiple cargos per trip and tracking the discrete location of each vehicle on each trip, but which schedules only one POE stop and one POD stop per trip (this is suitable when POE/POD channels have total movement quantities much larger than individual vehicle capacities, such as airlift or truck, for which only the last few vehicle trips are partially loaded)
- the most detailed *multi-port* algorithm, which utilizes cost-based route insertion heuristics to assign multiple pickup and delivery, stops on each vehicle trip.

In the model, any of the scheduling algorithms can be applied to any mode of transport as desired by the user. In general, the first two flow algorithms tend to over-estimate lift capability if few vehicles or large vehicles are available, since vehicle flows are split unrealistically among different routes and the discrete trip travel times and return times are not accurately calculated. (This is the difficulty with linear programming and network flow techniques used to model aggregate ports, time periods, and large discrete vehicles such as ships—the discrete scheduling and routing difficulties are aggregated away.). For large individual vehicles such as ships, it is recommended that the last two discrete scheduling and routing algorithms be used.

One issue for computer algorithms is how to define "costs" or penalties. In GDAS, penalties are used to evaluate the basic tradeoff between vehicle usage and cargo delivery timeliness. The penalty factors can be adjusted in the database to account for vehicle travel times ($/day), cargo lateness ($/ton-day), initial vehicle usage ($/use), port visits ($/visit), etc. as shown previously in Section 5.7.5. Some of the penalty

elements are calibrated from test runs, since factors such as lateness cost represent policy decisions that are not easily quantified.

In vehicle scheduling applications, it is very easy to develop solution algorithms that run for unreasonable amounts of time even on relatively small problems. Human schedulers are quickly able to screen out many impractical transportation alternatives because they know intuitively that the associated schedules are either infeasible or too costly. Similarly, they can focus special attention on difficult constraints such as shallow draft, based on experience in a particular port. The ability to screen out infeasible solutions early and focus more extensive tradeoff calculations for promising solutions is an important technique in reducing run time for GDAS algorithms as well.

One basic technique in GDAS is to precompute cargo/vehicle/facility matching arrays, which can be quickly checked for screening out infeasible combinations. In addition, for cost-based screening, a mathematical technique known as branch and bound is implemented which uses upper and lower bounds to eliminate many alternatives. If an upper bound on the best cost is already known based on some feasible solution (usually the best candidate solution found so far), then any time a new partial solution exceeds that known cost, the new solution can be rejected immediately as unacceptable, including all derived solutions. This upper bound screening can be further accelerated using lower bounds. If tight lower bounds on the potential cost for a solution can be determined quickly (typically using direct distance calculations and travel times in GDAS), then a partial solution can be rejected early if its partial cost plus the remaining lower bound exceed the known upper bound. An additional strategy is to permit the user to set criteria for "good enough" thresholds, which can lead to immediate assignments with much shorter search times. These strategies are used throughout all GDAS algorithms and significantly reduce the run time.

Basically the vehicle scheduling algorithm evaluates a large number of candidate cargo/vehicle assignments and selects those that are most promising for scheduling. Because of the large problem size, it is impossible to evaluate all assignments and combinations of assignments. Large scale integer programming optimization strategies such as Lagrangean relaxation were not attempted for this problem size, which has thousands of vehicles and perhaps a hundred thousand stops. Specialized greedy algorithms using route insertion techniques have been widely implemented in commercial vehicle scheduling systems and have been adopted for GDAS in the detailed scheduling algorithms. The GDAS strategy is somewhat different from other search strategies in that it alternates between a "greedy cargo" perspective and a "greedy vehicle" perspective, reflecting the basic conflict between cargo timeliness and efficient vehicle usage.

In the greedy cargo perspective, the next planned cargo, sorted by target lift time and priority within a rolling time horizon, is evaluated to determine the "marginal cost" of assigning it to all possible matching vehicles. This costing uses the route insertion algorithm discussed below, in which a candidate vehicle is evaluated including its previously assigned trips, stops, and cargos if any. In evaluating the candidate assignment cost, user-specified penalties are incurred for incremental vehicle time, cargo lateness, compartment stowage, port visits, new vehicle usage versus re-use, as well as the implied lateness effects on other cargos later in the schedule (this latter requires difficult iterative calculations but the implied lateness information is very important). The least-cost candidate vehicle assignment is then selected for the cargo, all schedules are updated, and successor cargos are re-planned.

If the assigned vehicle trip is not fully loaded by a cargo, then the scheduling algorithm switches to a greedy vehicle perspective. This perspective looks at other cargos in the same POE/POD channel and time horizon, costs out the candidate assignments, and selects cargo that can be added to the vehicle with reasonable penalty costs based on detailed route insertion. This switching to a vehicle perspective has proven to be very effective because the cargo algorithm alone tends to be too myopic about efficiently using the lift assets. The greedy vehicle approach is also important for run time efficiency, since it effectively aggregates movement channels "on the fly" and focuses on a small subset of promising candidate assignments, particularly for loading many small movement requirements on a large ship.

It should be noted that updating the vehicle schedules is more complex than might be expected because of the multi-modal transportation network. For example, if a single cargo is added to a previously assigned intertheater ship schedule, this can cause delays to all other cargos on board the same ship trip. These delays then propagate to the offloading of the cargos at later PODs, which again delays the onloading of successor cargos at POEs for the next transport leg (e.g., airlift in the theater). This can lead to later delays that must be recursively propagated throughout all schedules into the future. It is important to accurately update all of the future schedules in order to evaluate the potential side effects of a candidate cargo/vehicle assignment.

2.6.3 Simulation

The event-driven hourly simulation algorithm is executed each day to accurately calculate the arrival, departure, loading, unloading, and queuing events at each facility. The detailed facility throughput calculations and vehicle queuing delays can cause the simulated event times to vary from the original scheduled times. In addition, unforeseen surprise events can be injected and, as a future addition, stochastic sampling can be applied to the event times. The simulation algorithms use a standard approach that maintains a sorted heap (priority queue) containing the next incomplete simulation event for each vehicle trip. For efficiency, only one future event is stored on the heap for each trip, since successor events on a single trip cannot occur simultaneously; and later events are added as the predecessor events are completed. This also reduces the need to update future events stored on the heap. During simulation, scheduled events are pulled from the heap and executed, with further simulation forward into time where no interference can occur. Then the final simulated times are stored, the next event is put on the heap, any delays are propagated forward, and all future schedules are updated. Simulation is suspended at the end of each day, which provides a chance for additional planning and scheduling the next day prior to additional simulation.

2.7 Localized Subproblem Algorithms

2.7.1 Route Insertion

Route insertion is an important sub-algorithm used in scheduling to evaluate candidate cargo/vehicle assignments. The basic inputs for route insertion consist of a new candidate cargo to be assigned (with its planned POE, POD, and target lift times), plus a candidate vehicle for assignment (which may already have an itinerary consisting of trips, stops, and previously assigned cargos). The objective of the route insertion is to find the least cost change in the existing vehicle itinerary so as to pickup and deliver the new candidate cargo. Run time is an important consideration since the vehicle scheduling calls route insertion many times in costing out candidate assignments. An early route insertion algorithm using dynamic programming with branch and bound was rejected because of run time.

The current route insertion in GDAS uses a search heuristic to insert the POE and POD while iterating down the previously scheduled vehicle stops. The iteration begins at an earliest feasible insertion point, which is determined by the remaining capacity on each trip as well as the current simulation status (cargos cannot be inserted before historical stops which have already been simulated). In moving down the vehicle itinerary, the candidate POE is inserted if it can be processed prior to the next stop in the trip, subject to various other insertion rules. Then the POD is inserted within the same trip with similar insertion rules. The incremental insertion cost is accumulated down the route, including delays for other cargos scheduled on the same vehicle, possibly continuing to later trips. If the load quantity is too small or the insertion cost gets too high relative to the current upper bounds, the POE insertion may need to be re-started at a later point in the route, leading to a second or third pass on POE/POD insertion. Wherever possible, bounds are used to truncate the search early. Although many variations of route insertion have been discussed in the literature, the GDAS versions are particularly efficient for the situation in which routes tend to be unidirectional with POEs separated from PODs.

2.7.2 Port-to-Port Travel Times

The port-to-port travel time algorithm determines the "best" path for a vehicle from one port facility to another for a given route type, based on maximizing the overall payload throughput per unit time. The path algorithm takes into account the travel nodes and links, the allowable link constraints, link delays, refueling requirements at allowable facilities, and (for airlift) tradeoffs between allowable payload, critical leg distance (the longest leg without refueling), and total travel time including landings and takeoffs. An additional refueling complication occurs when refueling is not permitted at the POD, in which case the path algorithm must find a recovery base for refueling. After each path optimization, the cumulative path data is computed and stored for later re-use, including travel time, delays, attrition probabilities, routing restrictions, and convoy data if relevant. This incremental routing and storage is necessary because pre-calculation of a complete distance matrix encompassing all different route types is impractical, with literally millions of records, since different vehicle types have different routing constraints and refueling tradeoffs. Thus, the path algorithm builds a computed distance matrix incrementally as needed during the scheduling process. The path algorithm is called frequently during route insertion and scheduling, so it is a major run time concern even when the cumulative port-to-port results are stored and re-used once calculated. Initially, a fast path algorithm was developed using shortest path with directional lower bounding, but this did not adequately address refueling restrictions or payload tradeoffs. A dynamic programming algorithm was later developed, with multiple states at each node representing the non-dominated arrive time and critical leg, and with upper/lower bounds for branch and bound, but this method was too slow, even when initialized with shortest paths as upper bounds. Currently, GDAS uses multiple shortest path calls with iterations on critical leg distance and refuel weighting; a unimodal two-dimensional search is used to select the best route that maximizes the payload per unit time for each route type and each port-to-port combination.

2.7.3 Cargo Loading

The cargo loading subproblem is also solved many times during the scheduling algorithm to calculate how much cargo can be loaded into multiple compartments for a candidate lift assignment. The data structures are designed to handle all modes of transport within a common framework. The loading model is also designed to permit multiple capacity constraints based on actual cargo densities, so that "averaged" payloads and stow factors need not be calibrated for a specific theater or strategic leg. Airlift payloads, in particular, can change significantly for different cargo densities and for delivery to Korea versus the Caribbean, for example. For loading purposes, each vehicle can have multiple compartments, each with multiple capacities expressed in different units of measure. For example, a fast sealift ship may be represented with three or four compartments each with stowable capacity limits on both volume and area. Aircraft may have cargo-only compartments, passenger-only compartments, and/or shared compartments, each limited by volume, area, and number of passengers. In addition, each vehicle has a total payload capacity over all compartments, and this payload may depend on the critical leg of the vehicle route. For different compartments, the different cargo types have separate constraints and penalties for loading, as well as separate stow factors that vary by compartment type and capacity units of measure.

The loading model itself uses a least stow penalty heuristic for loading a given cargo on a vehicle. For each cargo, the allowable compartments are pre-sorted in order of preference; the multiple capacity constraints are evaluated for each compartment allowing for other cargos which may be on board; and the allowable load quantities are determined based on the most constraining capacity measure. Thus, the densities of the onboard cargos determine which capacity measure is the most constraining for a given compartment, in addition to the payload limits based on critical leg tradeoffs—the particular load may weight out, cube out, or square out. The loading model returns the amount of cargo that can be loaded in each compartment as well as a stowage penalty that is used in the objective function for scheduling.

2.7.4 Capacity Event Scheduling

In addition to assigning cargo to vehicles for transportation, the scheduling algorithm must reserve capacity at facilities and nodes into the future to account for bottleneck delays. The capacity reservation process is performed using an event-based algorithm. Each facility and measure with limited capacity is modeled using a forward linked list of capacity change events. At each event, the capacity (for one or more measures) is either decreased or increased by a specific amount. When a cargo begins loading, there is an associated event that reduces available capacity; when a cargo completes loading, there is an associated event that increases available capacity. Once facility capacity is saturated, a cargo may offload at a partial rate or may be blocked entirely until resources are freed up at a later event, causing delays. Each change in load rate has a capacity event. When the events are posted, they reserve space for cargo loading and unloading, or free up space, or change a load rate. Subsequent schedule evaluations can then account for the delays at constrained facilities, and even route around the bottlenecks. The capacity event algorithm is used both for transportation planning and for scheduling, to model the node and facility capacity utilization into the future. In addition, a similar algorithm is used to reserve capacity for each planning fleet during the initial transportation planning, prior to assigning individual vehicles in scheduling.

3. Database Design Guidelines

3.1 Database

In GDAS, a scenario database represents a collection of related information describing a single scenario for transportation analysis. Each scenario database is stored in a single subdirectory under GDAS and consists of a complete set of tables and data that define the scenario characteristics for the GDAS model.

3.2 Tables

All data for GDAS is stored in tables containing rows and columns. Each table stores information about multiple objects or entities that have similar properties or attributes. Different kinds of objects are stored in different tables, e.g. a cargo record is stored in the CARGO table and a vehicle record is stored in the VEHICLE table. Some tables store "conceptual" rather than physical objects, such as a Vehicle Type which is listed in the VehType table.

3.3 Rows and Columns

Within a table, each row, or record, stores all the data about a single object and basically represents that object. Each column stores one kind of data value, or field value, for the objects. The terms row, record, object, or entity are used interchangeably. The terms column, field, attribute, or property are also used interchangeably. The row/column structure of tables is directly apparent when the initial table view is displayed, as shown in Figure 3-1 for the VehFleet table. In the figure, the left-most column is an internal record number for display purposes only; it is not editable data and is transient, since it changes depending on the sort order of the table. Three of the data columns are displayed, the Vehicle Type, the Vehicle Identifier, and the Vehicle Fleet. A fourth column, Number of Vehicles, begins on the right with "Nu".

≡ [Esc]-Quit [Ins]-Add Delete [F2]-Post [F7]-Form Image More Help

Vehfleet Table View

VEHFLEET	Vehicle Type	Vehicle Identifier	Vehicle Fleet	Nu^
1	10Ton	10Ton	Truck Seoul	
2	22.5Ton	22.5Ton	Truck Taegu	
3	22.5Ton	22.5Ton	Truck Taegu A	
4	34Ton	34Ton	Truck Pusan	
5	5Ton	5Ton	Truck Pusan	
6	BB-Cont	ADABELLE LYKES (C/MOD)	US Commercial	
7	BB-Cont	CAROLINA (C/MOD)	US Commercial	
8	BB-Cont	EXPORT PATRIOT (C/MOD)	US Commercial	
9	BB-Cont	GUAYAMA (C/MOD)	US Commercial	
10	BB-Cont	HUMACAO (C/MOD)	US Commercial	
11	BB-Cont	LESLIE LYKES	MSC Force	
12	BB-Cont	MASON LYKES (C/MOD)	US Commercial	
13	BB-Cont	MAYAGUEZ (C/MOD)	US Commercial	
14	BB-Cont	NUEVO SAN JUAN (C/MOD)	US Commercial	
15	BB-Cont	PRES F D ROOSEVELT(C/MD	US Commercial	
16	BB-Cont	PRES HOOVER (C/MOD)	US Commercial	
17	BB-Cont	PRES KENNEDY (C/MOD)	US Commercial	
18	BB-Cont	RESOLUTE (C/MOD)	US Commercial	
19	BB-Cont	S-L ACHIEVER (C/MOD)	US Commercial	
20	BB-Cont	S-L ATLANTIC (C/MOD)	US Commercial	v

1 of 348 [|<] [<<] [<-] [->] [>>] [>|] [F1] [^^] [vv]

Vehicle Fleet | [F10]-Menu | View

Figure 3-1. Tabular View of the VehFleet table

3.4 Domains

Each column or field has an allowable set of values called a domain. Some domains are text, such as names or identifiers, and other domains are numeric. In Figure 3-1, the Vehicle Fleet column is text, and can store any user-defined alpha-numeric characters up to 15 characters. The Vehicle Type column also has a 15 character domain, except that for consistency the allowable values in VehFleet are restricted to those listed in the VehType lookup table (more on this later). The Number of Vehicles column has a numeric domain, consisting of non-negative integers from 0 to 32,767 (this is a "short" or two byte integer). Other domains used in GDAS include latitude and longitude, which are partially numeric and partially text with a particular format. All of the domains are defined in the Data Dictionary, and all data entries are checked immediately for consistency with the domain.

3.5 Key Fields

One of the most important operations in a database is to identify a particular record in a table, since each record represents a single object. Since records can be added or deleted or sorted, the internal record number is not a stable identifier. Instead, data values are used to identify objects. The data in a record is specific to a single object and represents that object; every record has something different about it, or else it basically becomes indistinguishable as a separate object.

The minimal set of data that uniquely identifies a record in a table is called the "key" field(s). A record is uniquely identified by the values of its "key" fields. Stated another way, no two records can have the same values in their key fields. In fact, attempting to insert a new record having the same key values as another record yields a warning in GDAS, since it may overwrite existing data about the matching record. The key field values uniquely identify or "name" the object or record, which is then further described by the non-key field values or attributes. Key fields can be text identifiers (similar to names) or numeric identifiers (often used for output tables in GDAS, such as the TRIP table). In changing a non-key field, you are describing the data about an object; in changing a key field, you are changing the name or identifier that represents an object. To insert a new object, you must identify it uniquely with the key field values.

In the VehFleet example, the key fields are the first three fields, so that any VehFleet record is uniquely identified by its Vehicle Type, Vehicle Identifier, and Vehicle Fleet values. Two records can have the same Number of Vehicles (a non-key attribute), but they must be different in at least one key field value.

Because of the importance of key fields, GDAS always places the intrinsic key fields first in a table. In addition, the table is sorted by the key fields by default. In a form view, the key fields have a background of dark blue (versus light blue or cyan for non-key fields) to emphasize the key field importance in identifying the record.

3.6 Forms

Forms in GDAS allow you to view all of the data about a single record or object. Thus, the data displayed in a form view all pertain to the object uniquely identified by the dark blue key field values for the current record. Form views are especially useful for data entry, since generally it is easier to work with one object at a time. The form view for the Vehicle Fleet table is shown in Figure 3-2. The basic fields for the VehFleet record are shown in the upper left area of the form for a Vehicle Type of C-141, Vehicle Identifier of C-141 (in this case, only one kind of C-141 vehicle is defined, so they have the same name), and a Vehicle Fleet of "McChord AFB" (this fleet name matches the Start Node in this case, but need not in all cases, since the same kind of vehicles can start out at the same node at different times).

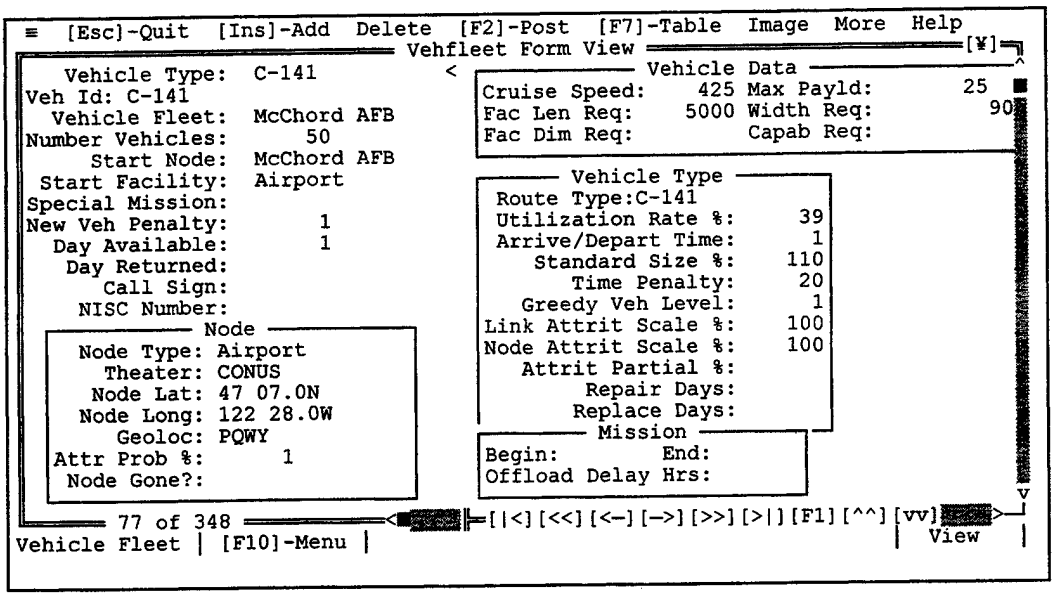


Figure 3-2. Form View of the VehFleet table

Form views can also display related information from other tables. The convention in GDAS forms is that data from other tables are displayed in separately boxed areas on the form, with a single line border for singly related records (used for lookup tables such as VehType in the figure), and a double line border for multiple related records (a 1 to many relationship, not shown in the VehFleet example). The data in related tables on a form still pertain to the key fields of the base table. For example, the Node area on the VehFleet form gives the Latitude and Longitude of the Start Node (McChord AFB in this case), the Vehicle Data area specifies the Cruise Speed of the Vehicle Type and Identifier (C-141 in the case), and the Vehicle Type data specifies the Arrive/Depart Time (or landing/takeoff time) for the referenced Vehicle Type (C-141 in this case). The multi-table form view makes it convenient to view and edit related data in other tables while editing the VehFleet records.

3.7 Lookups, Relationships, and Foreign Keys

As seen in the form view, the data stored in a table is often related to other tables. For example, the Start Node and Start Facility values for a VehFleet record must reference a valid Node and Facility listed in the Facility table. These "lookup" or cross reference fields ensure that the data is consistent between different tables. In relational database theory, such lookup fields from a "child" table to a "parent" table are known as foreign keys in a one-to-many relationship. The relationship is termed one-to-many since each VehFleet record, for example, has exactly one matching Facility record for its Start Node and Start Facility, whereas a Facility record can be referenced multiple times by different vehicle fleet records. The lookup table Facility is known as the parent table, and the referencing table with foreign keys such as VehFleet is known as the child table. The lookup relationship can be a single key field, as in the Special Mission field in the figure, or multiple key fields, as in the Start Node and Start Facility. The uniqueness of key fields is what makes it possible to define relationships in terms of foreign key field references.

In GDAS, the lookup tables serve as a pick list accessed using the F1 key, so that it is easy to select the matching parent record and store it in the child table being edited. In addition, all key field relationships are checked whenever record edits are posted.

In order for the key field references to make sense, you need to work in a "top down" direction for new records. This means that parent records need to be created before referencing their key fields in a child record. For example, node records need to be created in the Node table, and then facility records added for that node in the Facility table, before a vehicle fleet record in the VehFleet can be assigned to start out at the new nodes and facilities.

3.8 Data Dictionary

The Data Dictionary provides a complete definition of the tables, fields, key fields, domains, lookups, units of measures, and descriptions in the GDAS system. The online Help/Data menu provides immediate access to the Data Dictionary while you are editing tables. One of the most valuable uses of the Data Dictionary is to understand the relationships between tables so that you can work in a consistent, top-down fashion in defining new records in GDAS (e.g., for adding a new Transport Mode).

The complete Data Dictionary is provided later. An extract for the VehFleet table is shown in Figure 3-3. The first boxed area lists lists the 8 character table name VehFleet, its long table name "Vehicle Fleet", and a description of the table. Below the table information is a list of fields belonging to the table along with field definitions. In the field list, the first column repeats the table name, VehFleet. The second column lists the field number and field name, e.g. the first field is Vehicle Type.

User Dictionary

VEHFLEET Vehicle Fleet	Lists the availability of vehicles by starting location, starting time, and number of vehicles

Table		Field Name	Domain/ Lookup	Key?	In/Out	Unit Meas	Description
VEHFLEET	1	Vehicle Type	VEHDATA	Y	In		Vehicle type
VEHFLEET	2	Vehicle Identifier	VEHDATA	Y	In		Vehicle identifier for this start location
VEHFLEET	3	Vehicle Fleet	A15	Y	In		Fleet identifier for this start location
VEHFLEET	4	Number of Vehicles	Short>=0		In		Number of vehicles in the fleet for this vehicle type
VEHFLEET	5	Start Node	FACILITY		In		Home base node for this fleet and vehicle type (a vehicle returns to its home base if not otherwise assigned)
VEHFLEET	6	Start Facility	FACILITY		In		Home base facility for this fleet and vehicle type (a vehicle returns to its home base if not otherwise assigned)
VEHFLEET	7	Start Day Available	DayToHr		In	day (hr)	Day that this fleet and vehicle type are first available
VEHFLEET	8	Last Day Returned	DayToHr		In	day (hr)	Day that this fleet and vehicle type are returned to base with no more use (blank or 0 is treated as available to the end)
VEHFLEET	9	Special Mission	MISSION		In		Special mission which restricts this fleet to matching special mission movement requirements for a designated time period
VEHFLEET	10	New Vehicle Penalty	Short>=0		In	$/new veh	Penalty for the first use of a new vehicle of this type and fleet
VEHFLEET	11	Call Sign	A4		In		International call sign of the vehicle or ship or fleet
VEHFLEET	12	NISC Number	A5		In		Naval Intelligence Security Code number of the vehicle or ship fleet

Figure 3-3. Data Dictionary Extract for the VehFleet Table

The third column is labeled as "Domain/Lookup", meaning that it displays either a domain or a lookup table. If an upper-case lookup table name is shown, then the field has a lookup, and the domain is inherited from the parent table. For example, the first two fields have a joint lookup into VehData, which means that all Vehicle Type and Vehicle Identifier combinations in the VehFleet must match the parent values in the VehData lookup table, and they are text strings or names. Similarly, the Start Node and Start Facility fields have a joint lookup to the Facility table. This means that you must create a matching node and facility in the Facility parent table before you can assign vehicles to start at that facility in the VehFleet table. The two "foreign key fields", Start Node and Start Facility in the VehFleet child table, must match the parent key fields, Facility Node and Facility Name, for a parent record in the Facility table. The lookup values are always the key fields of the parent table.

If the third column is not a lookup table, it represents a domain. For example, the Vehicle Fleet field has a domain of "A15", which means any alphanumeric text string up to 15 characters in length. This means you are free to give any name you wish to the Vehicle Fleet (no lookups are enforced). Of course, preferably the name is descriptive; in Figure 3-1 shown previously, the vehicle fleet names tend to match the start node.

The field Number of Vehicles has a Domain of "Short>=0", which means a nonnegative short integer (values between 0 and 32,767). Other typical numerical domains may incorporate ranges, such as "1,99" or

"0,99999" or "0,15". Additional ranges include "Long+/-" (any integer), "Double>=0" (any nonnegative floating point number), and "reqqn" (a nonnegative integer domain).

The fourth column shown in the Data Dictionary is labeled "Key?" and displays a "Y" if the field is a key field. For the VehFleet table, the first three fields are key fields, as indicated in the figure. GDAS always lists key fields first for each table.

The key fields of a table may themselves be lookups. In the example, the first two key fields are lookups into the parent VehData table, whereas the third key field is a domain consisting of any 15 character alphanumeric string, with no lookup. The non-key fields may also be lookups or domains.

Additional information in the Data Dictionary shows whether the field is "In" or "Out", meaning that it is either an input to the model or an output from the model. Some reference data is neither input nor output.

The Unit of Measure is indicated where appropriate. The Start Day Available field has a unit of measure indicated by "day (hr)", which means that data input is in whole days, but this is converted to hours for the hourly simulation used in the model itself. In general, the model performs all calculations in hours for higher accuracy in travel times and load rates, and to make cumulative differences in these parameters visible for sensitivity studies. Realistically, however, the data inputs (availability day, required delivery day, earliest delivery day, etc.) are not accurate even to the nearest day, so database inputs and outputs are typically stored in days rather than hours.

Finally, a description of the field is provided. All of this information is available on-line, while editing the tables, by pressing the F10 Menu key, then selecting Help/Data.

3.9 Database Hierarchy

The lookups in the database create a logical hierarchy of tables which define objects from parent to child. At the highest levels, the ultimate parent tables have few or no additional lookups, and their key fields define the very basic reference objects of the system that are rarely changed. Such basic reference tables include the transport modes in the Mode table, or the units of measure in the Measure table, or the cargo classes in the CargoCat table, or the cargo categories in the CargoCat table. At an intermediate level, the tables contain data that may be expanded for a new analysis task, such as adding a new vehicle type in the VehType table with new compartments in the VCptType table. The most frequently modified data is contained in the lower child tables, such as the available lift assets in the VehFleet table, the movement requirements and quantities in the Require and ReqQuan tables, or new intra-theater facilities in the Facility table.

The data tables can be edited in any order, but when adding new records it is best to work from top down in the logical hierarchy. For example, in the VehFleet table it is impossible to start a new vehicle fleet at a facility that does not exist yet. The fleet can be created, and assigned temporarily to some existing facility, but it cannot be assigned to a new facility until that facility is created in the Facility table.

To assist in understanding the database hierarchy, the complete set of database tree diagrams can be displayed from within the system under the Tools menu. These tree diagrams display tables arranged from parent to child. A hierarchy example starting from the Mode table is shown in Figure 3-4. Because the Mode table is basic to the entire system, its hierarchy tree is quite long and shows most of the tables. In the figure, is can be seen quickly that VehFleet looks up into VehData, which looks up into VehType, which looks up into RoutType, which looks up into the ultimate parent Mode table. The tree diagrams do not provide additional information compared with the Data Dictionary; they simply sort the tables in order of lookup hierarchy.

This depth of the hierarchy tree may look intimidating, but most of the time you change only the data at the lowest levels, and the parent tables act as basic reference tables. When editing, the lookups seem natural since the F1 Lookup key easily pops the proper values into place. The depth of the tree simply means that GDAS is completely table driven. No "hard coding" is embedded in the model to account for different modes, routing constraints, vehicle types, cargo categories, units of measure, etc. Every transportation data element and constraint is defined in the database, even to the level of the underlying transport modes and units of measure. This table-driven nature provides a great deal of flexibility in tailoring GDAS to your study requirements, either at a quick feasibility level (Ston flows), or at a very detailed level (individual unit equipment dimensions). The only parts that are "hard coded" are the scheduling and simulation algorithms themselves. Even these can be assigned by the user for each mode, based on the choices listed in the display-only table SchedTyp.

3.10 Database Design Guidelines

The following standard database design guidelines have been followed in structuring the GDAS tables.

3.10.1 Atomic Database Fields/Object Properties

Define atomic fields, i.e. subdivide fields until all internal sub-fields are explicitly separated. All fields are specified as simple domains or as lookups to other tables. This permits simple domain checks, explicit relationships, simpler queries, non-redundant data.

3.10.2 Key Fields

Every table should be keyed to uniquely identify the records. Otherwise, a query cannot distinguish which record to update, duplicate entries can occur, relationships cannot be enforced, and data checks cannot tell if a duplicate record should be retained or discarded. Key field names should be consistent throughout the database, although some variations may be permitted when multiple fields have different roles in a single table, such as From Node and To Node in the NodeLink table.

3.10.3 No Data In Key Fields

Key fields provide a naming convention for the user to easily recognize a specific record. The database and model should NOT be sensitive to the contents of a key field, since it may be changed or extended, either by design enhancements or by the user. Another way to state this is that renaming the data in a key field can be propagated automatically throughout the database with no side effects in the code itself.

3.10.4 Relationships

Define relationships as lookups from a child table to parent table keys that can be enforced by the database engine.

3.10.5 Normalization and Non-Key Data Fields

Normalize non-key data attributes to depend on the whole key and nothing but the key, i.e. put the data in the right place. Where data elements have the same key, the can be merged into single tables depending on other factors. Any data that is derived from other data should not be input by the user.

3.10.6 Repeating Column Removal

Convert repeating columns to multiple records. This provides greater flexibility, since new data can be added as records rather than needing programmer changes to add columns. Plus, summary queries can be performed.

3.10.7 Separation of Inputs and Outputs

Separate input data from output data, normally in separate tables. Make sure the user is aware of which is which.

3.10.8 Data Checking

Specify data consistency rules using only domains, key field uniqueness, and key field lookups, where possible. This permits the database engine to implement many data checks directly, even when data is edited using queries.

3.10.9 Miscellaneous

GDAS uses long table names and fields names for easier understanding by new users. GDAS excludes spaces in table names, since databases like Paradox cannot handle it, but the Windows version does use title case, such as in "FacilityType". GDAS does use spaces in field names for readability, such as "Unit Description"

GDAS tries to have readable key fields, even though this can take more disk space and have slower indexing (bookkeeping is what the computer is for, and it remains fast for hundreds of thousands of records).

In any case, no algorithms or queries are permitted to depend on the specific contents of a key field; any re-naming should have no affect on results, so user changes to key fields and new entries are safe in the model. The only exception is for raw imported data from outside sources, where it is often necessary to use sub-fields and translations.

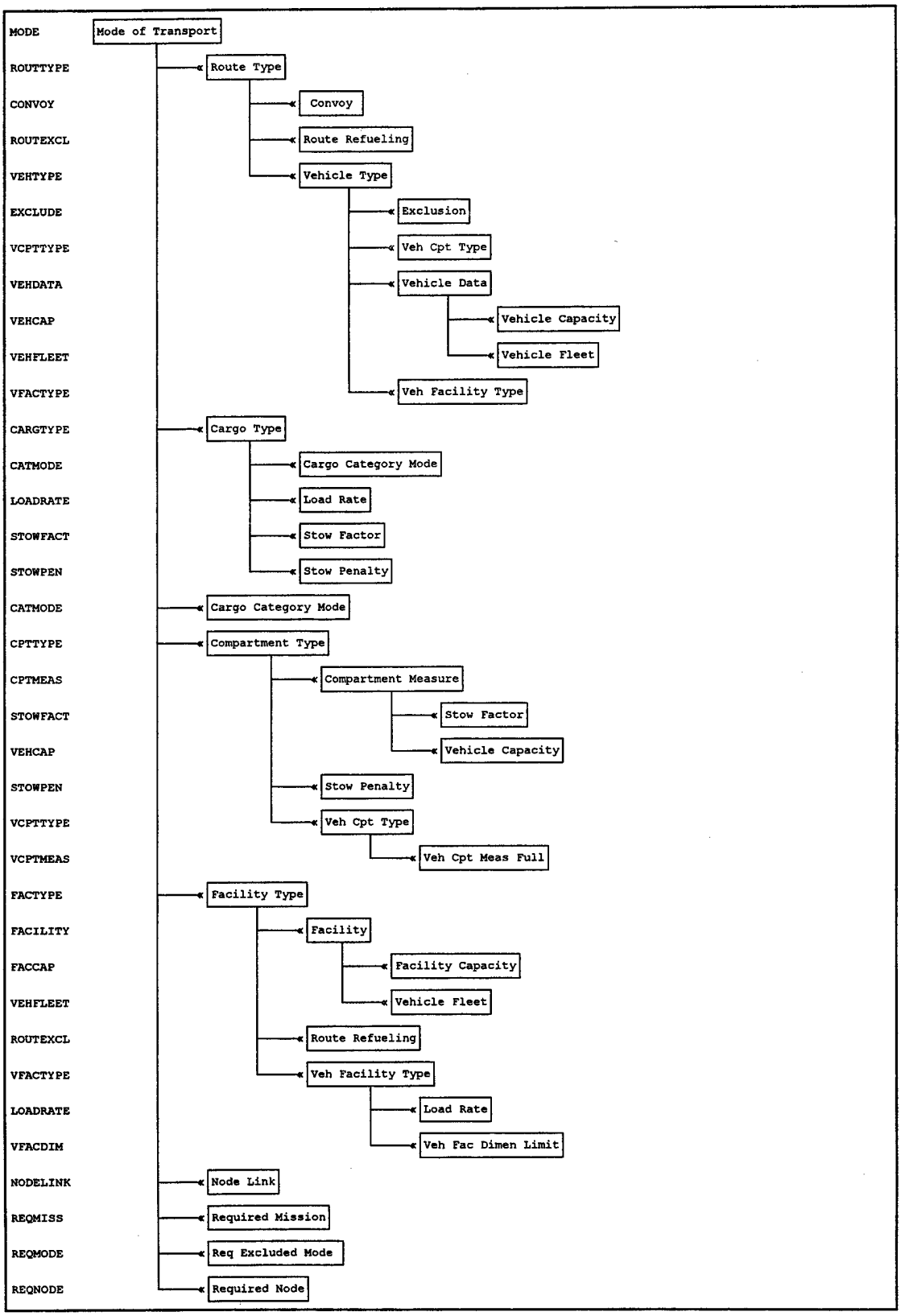


Figure 3-4. Database Tree Showing the Lookup Hierarchy from the Parent Table Mode

4. Database Tables

4.1 Data Overview

The transportation data in GDAS can be grouped as follows:

- *Transport Vehicles and Lift Assets*, which define the modes of transport, vehicle types for transporting cargo, compartment types, vehicle characteristics, and fleet availability.
- *Transportation Network Data*, which define the node locations, transport links, port facilities, and facility throughput constraints.
- *Movement Requirements*, which define the quantities to be moved, the origins and destinations, the ready to load times and required delivery times, and any required POEs, PODs, and modes.
- *Loading Characteristics*, which define the matching constraints, stow factors and load/unload rates for loading different types of cargos on different vehicle types and compartments types at different facility types.
- *Output Tables*, which represent the output schedules and detailed simulation results for vehicle trips, stops, cargos, as well as summary data such as cumulative delivery profiles.
- *Special Topics*, which define more specialized data elements for convoys, attrition, etc.

The various data tables and fields are discussed in the sections following.

4.2 Transport Vehicles and Lift Assets

Figure 4-1 on the next page provides an overview of the GDAS entities relating to transport vehicles and lift assets. Each table, or object class, is represented by a rectangle labeled with the table name. The lines connecting the tables represent one-to-many relationships, where the "crow's foot" symbol corresponds to the many side. The dashed rectangles represent tables that are generated by the model and not by user input. For example, in Figure 4-1, moving from the upper left corner down the diagonal, the basic Mode table lists the Transport Modes; each Transport Mode can have zero, one, or more Route Types which are listed in the RoutType table; each Route Type can have zero, one, or more Vehicle Types which are listed in the VehType table; each Vehicle Type can have zero, one, or more Vehicle Data records listed in the VehData table; each Vehicle Data record can have zero, one, or more Vehicle Fleets available in the VehFleet table; and each VehFleet record generates zero, one, or more distinct Vehicles in the Vehicle table after the model is run. This hierarchy defines the physical characteristics of the lift vehicles as well as their availability. In addition, there is an administrative hierarchy that can be used to restrict how the vehicles are used in planning and scheduling. Again, from the upper left, each Transport Mode in the Mode table can have zero, one, or more Planning Fleets in the PlanFlt table; each Planning Fleet can have zero, one, or more Administrative Fleets in the Fleet table; and each Fleet is associated with zero, one, or more Vehicle Fleet records in the VehFleet table. In addition, each Planning Fleet can optionally have a set of pre-scheduled Standard Stop records in the StdStop table, often used for cyclical liner operations. The various tables are discussed in the paragraphs following, with futher details given in the Appendices. When studying the data structures, it is extremely helpful to review example tables such as provided with GDAS in the Sample database scenario.

Although the number of vehicle-related tables may seem large, all the data tables except the last shown in Figure 4-1 provide generic "type" data which are relatively static and do not change from run to run. For example, the transport modes and vehicle types are typically standardized for DoD OPLAN studies and

change only rarely. In fact, many models do not let you change the modes or vehicle types or compartment types at all, and it becomes difficult to define new vehicle types. In GDAS, *all* data is accessible in the database tables. In the figure, the only table which does typically change for different runs is the VehFleet table which establishes the availability of different transport vehicle lift assets.

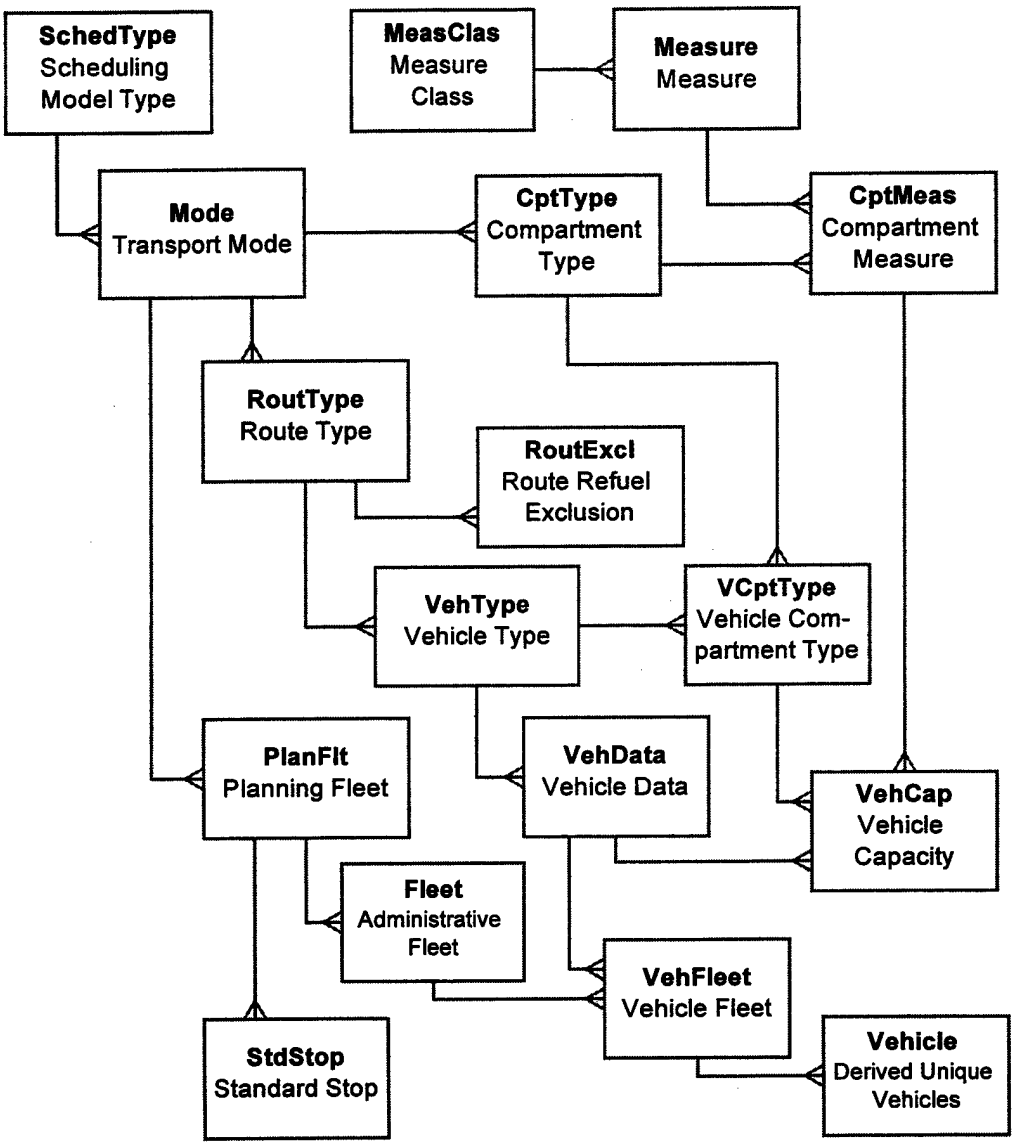


Figure 4-1. Data Tables and Relationships for Transport Vehicle Lift Assets

4.2.1 Transport Mode

The Mode table lists the transportation modes that are available for delivering cargo. Typical modes of transport include Airlift, Sealift, Truck, Rail, Pipeline, and InPlace. At a more detailed level, modes might include facility transfers such as Crane, Forklift, Containerization, etc. These modes can be created, deleted, or renamed as desired for a particular study. In GDAS, the concept of mode represents a basic partitioning of transportation links and facilities into separate sub-networks on which only the matching transport vehicles or lift assets can travel. For example, Airlift and Sealift are different modes so they cannot travel on the same network links. Similarly, if strategic airlift and theater airlift are to fly on the

same links and compete for the same airport facilities, then they must be assigned a common mode of transport such as Airlift. As discussed later, each transportation link in the network and each facility at a node are assigned a single mode of transport.

Data elements stored in the Mode table are listed in Figure 4-2.

Field Name	Description
1 Transport Mode	Name of a transport mode (e.g. Airlift, Sealift, Rail, Motor, Pipeline, Generic, etc.)
2 Scheduling Model Type	Scheduling model algorithm type used for this mode of transport
3 ASCII Code Abbreviation	ASCII code of a single upper case letter abbreviation used by the model to display on-screen activity progress (S for Sea, A for Air, etc., with lower case for planning and upper case for scheduling and simulation)
4 Letter for Model Display	Single letter for this mode, used to display progress during model execution (most useful if the letters are unique across modes)

Figure 4-2. Data Elements for the Mode Table

4.2.2 Scheduling Model Type

Each transport mode listed in the Mode table is assigned a Scheduling Model Type, which determines how GDAS performs scheduling for that mode. The available scheduling models are organized in the SchedType table by level of detail, ranging from the most detailed Multiport Algorithm to the simplest Travel Time algorithm as shown in Figure 4-3. For large discrete lift assets, such as ships, the mode detailed, multi-trip, multi-port scheduling algorithm is recommended unless the movement requirements are packaged or aggregated up to reasonably full ship loads. For aircraft, which often have capacities much smaller than a single movement requirement, the Pickup Deliver algorithm is somewhat faster but still quite detailed, tracking discrete multiple trips each with a single pickup and delivery airport, but allowing for multiple cargo loads at each POE and POD. Truck and Rail are also suitable for the Pickup Deliver model, particularly if vehicle sizes are aggregated to represent truck convoys and trains. The Vehicle Flow model allocates limited vehicle capacity and available hours to various movement channels, but does not track each vehicle location precisely over time. The Travel Time algorithm is the least detailed algorithm; it computes travel and loading times assuming unconstrained vehicle availability and determines the number of trips required. All of the scheduling algorithms take into account node and facility throughput constraints.

Scheduling Algorithm	Level of Detail	Description
Multiple Ports	Very High	Tracks each vehicle trip with multiple pickups and deliveries, schedules using detailed route insertion
Pickup Deliver	High	Tracks each vehicle trip with a single pickup and delivery, schedules new trips at the end.
Vehicle Flow	Medium	Schedules trips with limited vehicles by allocating available vehicle hours to trip cycle times without tracking individual vehicle locations.
Travel Time	Low	Performs travel time calculations and assumes sufficient vehicles are available when needed.

Figure 4-3. GDAS Scheduling Algorithms

4.2.3 Vehicle Type

Within a mode of transport, the lift assets for moving cargo are classified by Vehicle Type in the VehType table. For example, the Airlift mode typically has vehicle types such as C-141, C-5a, C-5b, C-130, B-747, etc. For sealift, typical vehicle types include Breakbulk, RORO (roll-on roll-off), Container, Fast Sealift, etc. The Vehicle Type represents a grouping of lift assets or transport vehicles that share general loading characteristics, such as type of compartments, type of facilities that can be used, matching of cargo that can

be loaded, stow factors, load/unload rates, and routing constraints. If any of these characteristics are not shared in common, then new vehicle types need to be added. Other detailed characteristics, such as speed and payload, may vary by individual vehicle within a Vehicle Type and are specified in the VehData table.

Field Name	Description
1 Vehicle Type	Vehicle type name, e.g. Breakbulk for sealift, C-17 for airlift, etc.
2 Route Type	Route type to use for this vehicle type
3 Arrive/Depart Time	Combined total additional time for node arrival and departure for this vehicle type, such as takeoff/landing time or port maneuver time (adds to travel time and reduces the average block speed, but does occur not affect facility parking)
4 Vehicle Standard Size %	Size of vehicle relative to "standard" vehicle size, may exceed 100% for larger vehicles, used for allocating facility berths or parking spaces (MOG)
5 Time Penalty	Penalty for vehicle usage per hour, used to compare with cargo lateness in the scheduling algorithm
6 Greedy Vehicle Level	Limit on the acceptable cost/benefit ratio for a greedy vehicle trying to get additional cargo immediately after an assignment
7 Link Attrit Multiplier %	Attrition adjustment multiplier applied to the link attrition or breakdown rate for this vehicle type while in transit (blank or 0 is treated as 100%)
8 Node Attrit Multiplier %	Attrition adjustment multiplier applied to the node attrition or breakdown rate for this vehicle type while at the node (blank or 0 is treated as 100%)
9 Attrit Partial Damage %	Percent of attritted or broken down vehicles which are partially damaged and can be repaired
10 Repair Days	Delay days for repair of a partially damaged vehicle, after which the vehicle continues its scheduled itinerary
11 Replace Days	Nonzero vehicle replacement time at the initial ALD node after total attrition (if blank, no replacement occurs)

Figure 4-4. Data Elements for the Vehicle Type Table (VehType).

4.2.4 Route Type

Each Vehicle Type is assigned a single Route Type from the RoutType table. A Route Type is associated with a single mode of transport and is used to determine which links a particular kind of Vehicle Type can travel on. Different Vehicle Types can generally travel on matching links that have the appropriate transport Mode, but the routes and links actually taken can be affected by critical leg/payload tradeoffs (for airlift) and canal constraints (for sealift).

In GDAS, a "route" consists of a sequence of travel links and intermediate nodes from one facility to another facility for a single mode of transport. A Route Type as listed in the RoutType table specifies the routing characteristics that determine which of several available routes is most suitable. Several route type can apply to the same mode and share the same network links, but have different routing factors such as refueling feasibility at intermediate nodes, link compatibility such as canal constraints, and payload versus critical leg distance tradeoffs. These variations in Route Type permit some vehicles to have different routes with different travel times, even though they share the same transport mode and network links.

Field Name	Units	Description
1 Route Type		Route type for computing vehicle paths
2 Transport Mode		Transport mode for this route type
3 Speed to Convert Delays	nmi/hr	Nominal routing speed which is used to convert link delays and refueling delays to equivalent distances for routing, in nautical mph
4 Range at Max Payload	nmi	Range or critical leg distance corresponding to the maximum allowed payload, in nautical miles
5 Payload Decrease %/kmi	%/1000nmi	Percent decrease in payload per 1000 nautical miles of increase in critical leg distance beyond the max payload range
6 Refuel Arrive/Depart Time	hr	Arrival and depart time delays for refueling (e.g., landing and takeoff delays)
7 Refuel Time	hr	Refueling time in the facility
8 Required Link Rating		User-definable link rating required for each link in a feasible path for this route type; for example, for sealift the Required Link Rating may represent ship draft, which cannot exceed the Link Rating (link draft) of any link on a feasible path
9 Refuel Fac Length Req	ft	Facility length required for refueling
10 Refuel Fac Width Req	ft	Facility width required for refueling
11 Refuel Fac Dimension Req	varies	Facility dimension required for refueling (e.g., draft for sea)
12 Refuel Fac Rating Req	varies	Facility rating level required for refueling (e.g., LCN or landing classification number for air, boom capacity for sea)

Figure 4-5. Data Elements for the Route Type Table (RoutType).

4.2.5 Refueling Constraints and Payload Affects

Refueling is an important consideration for vehicles such as aircraft, when range is limited and the payload may depend on the "critical leg", which is the longest travel distance between refueling points. In such cases, a tradeoff exists between refueling more frequently with higher payloads and slower travel times, versus refueling less frequently with lower payloads and faster travel times. If the Range at Max Payload exceeds the travel distance (e.g., for ships) then GDAS does not model refueling. If the Payload Decrease is zero, the range becomes a routing constraint but does not affect the allowable payload. If the Payload Decrease is nonzero, then GDAS models the payload dependencies using a piecewise linear approximation as shown in Figure 4-6. For instance, a C-5 Route Type may have the following characteristics: Range at Max Payload of 2000 miles, and Payload Decrease of 12%/kmi after exceeding the initial 2000 miles, as shown in the figure ("kmi" denotes 1000 miles). If the "critical leg" distance on one or more links between refueling points is 3000 miles, then the payload is reduced by the following calculation:

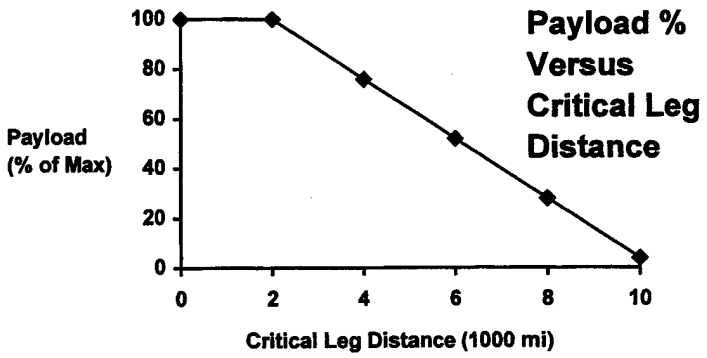


Figure 4-6. Payload Percentage Versus Critical Leg Distance Between Refueling

Payload Reduction % =

= (Critical Leg Distance - Range at Max Payload)*(Payload Decrease %/kmi) / (1000 mi/kmi)

= (3000mi - 2000mi) * (12%/kmi) / (1000 mi/kmi)

= 12 % reduction.

The allowable payload is therefore 88% of the maximum for traveling 3000 miles without refueling. For an empty aircraft on a return flight, the maximum range when flying empty is given by:

Empty range = Range at Max Payload + 100% Reduction*(1000mi/kmi) / (Payload Decrease %/kmi)

= 2000mi + 100%*(1000mi/kmi) / (12%/kmi)

= 10,333 mi.

It should be noted that a loaded route may be different from an unloaded empty route because the aircraft refuels more frequently on the loaded route to carry the cargo payload.

Different aircraft may have different Route Types with different refueling characteristics, so that they may travel on different routes. In determining the "best" route, GDAS evaluates alternative links, nodes, link constraints, refueling points, refueling times, landing/takeoff times, critical leg distances, and payloads to maximize the overall payload delivered per unit time. The routing algorithm is one of the more sophisticated components of the model.

For Route Types that do model refueling, various facility types can be excluded for refueling using the RoutExcl table. An additional consideration is that an aircraft may not be able to refuel at a POD based on the refuel exclusions in RoutExcl, so a recovery base must be found prior to refueling.

4.2.6 Vehicle Data

For each Vehicle Type, there can be multiple Vehicle Data records in the VehData table. Whereas the Vehicle Type defines the general routing properties, generic loading factors, and the types of compartments, the Vehicle Data record specifies the individual vehicle characteristics such as Cruising Speed, Facility Length Required, Max Cargo Load in Ston, etc. For sealift, each Vehicle Data record in VehData typically represents a single unique ship, since each ship has its own unique characteristics. Thus, there may be many ships having a Vehicle Type of Breakbulk, each ship being listed in VehData with unique characteristics. For airlift, at the other extreme, each Vehicle Data record may simply correspond to the Vehicle Type itself, since all C-141 or C-5a aircraft share the same cruising speed, etc. In this case, there may be only one VehData record or a few variations for a given Vehicle Type.

Field Name	Units	Description
Vehicle Type		Vehicle type name
Vehicle Identifier		Vehicle identifier for this vehicle data
Cruising Speed	nmi/hr	Cruising speed of this vehicle, in nautical mph
Max Cargo Load	Ston	Maximum allowed cargo load over all compartments for this vehicle, in ston
Facility Length Required	Ft	Facility length required for loading and unloading
Facility Width Required	Ft	Facility width required for loading and unloading
Facility Dimension Required	Varies	Facility dimension required (user-definable, e.g., draft for sea)
Facility Rating Required	Varies	User-definable facility rating required for loading and unloading (e.g., landing classification number for air, boom capacity for sea)

Figure 4-7. Data Elements for the Vehicle Data Table (VehData).

4.2.7 Vehicle Fleet

The Vehicle Fleet records in the VehFleet table list the actual availabilities of vehicles by location, starting time, and number of vehicles. For sealift, each ship may be assigned a unique location and starting availability with the Number of Vehicles set to one. For smaller transport vehicles, numerous vehicles may be "cloned" as a fleet or squadron of vehicles that are available at a single location and starting time (this can also be done with sealift if you wish to quickly clone one or more ships). If vehicles have different starting locations or times then they must be entered as additional Vehicle Fleet records; several different Vehicle Fleet records can reference the same Vehicle Data record in the VehData table.

The Fleet table that is also shown in the figure is computed from the VehFleet table and is not entered directly. It simply lists the unique Fleet values entered into the VehFleet table. The purpose of the Fleet table is to provide a lookup for excluding fleets from specified theaters, nodes, or requirement types.

Field Name	Units	Description
Vehicle Type		Vehicle type
Vehicle Identifier		Vehicle identifier, such as ship name or aircraft squadron, for this starting location, vehicle type, and fleet
Vehicle Fleet		Fleet identifier for this starting location
Number of Vehicles		Number of vehicles in the fleet for this vehicle type
Start Scheduling Day	day (hr)	Administrative day that this fleet and vehicle type are first available for scheduling new trips, stops, and cargo
Stop Scheduling Day	day (hr)	Stop day after which this fleet and vehicle type are returned to its starting node or route with no more use (blank or 0 is treated as available through the simulation end date)
Start Node		Starting home base node for this fleet and vehicle type (a vehicle starts at and returns to its home base if not otherwise assigned)
Start Facility		Starting home base facility for this fleet and vehicle type (a vehicle starts at and returns to its home base if not otherwise assigned)
Start Route Offset	day	Offset day for this fleet and vehicle for a standard prescheduled starting route cycle
Start Route Last Day	day (hr)	Last day beyond which the prescheduled starting route is no longer cycled
Special Mission		Special mission which restricts this fleet to matching special mission movement requirements for a designated period of time
New Vehicle Penalty	$/new veh	Penalty for the first use of a new vehicle of this type and fleet
Call Sign		International call sign or identifier of the vehicle and fleet
Other Identifier		Other identifier such as NISC (Naval Intelligence Security Code) for the vehicle and fleet
Requirement		Requirement by which this vehicle fleet is delivered (these vehicles are not available until the requirement is completely delivered)

Figure 4-8. Data Elements for the Vehicle Fleet Table (VehFleet).

4.2.8 Planning Fleet

The PlanFlt table is used to group similar sub-groups of vehicles within a Transport Mode into Planning Fleets for evaluation by the planning algorithm. This makes it is possible to specify different planning fleets within a mode for tracking vehicle capacity and facility capacity during planning, since planning does not assign individual vehicles. All of the planning factors, such as Planning Speed and Planning Ton-Hour Penalty, are now consolidated in the more PlanFlt table, as summarized in the attached dictionary elements.

Previously, planning was based on modes, so that the planning algorithm selected the end-to-end modes (in addition to nodes and configurations), and passed this information to scheduling. This captures major vehicle characteristics and in many cases this approach may still be appropriate. In fact the default GDAS test scenario has one Planning Fleet for each Mode. For example, a "Sealift" planning fleet is defined for the "Sealift" mode.

More recently, the new planning algorithm adds tracking of vehicle capacity constraints, in addition to node/facility capacity. Planning still uses a cargo flow model prior to scheduling, but both the facility and vehicle capacity constraints are tracked over time as each cargo is planned for movement during specific time intervals. Planning does not assign individual vehicles using detailed multi-port itineraries, which is performed in scheduling. But planning does make alternative decisions based on the total capacity available for different units of measure, vehicle compartment capacity, and facility throughput. Because different vehicles can load different amounts of cargo, the planning process cannot simply count the number of vehicles needed. Instead, planning evaluates the amount of cargo that can be loaded, which means it must track key loading factors including multiple units of measure (Mton, SqFt, etc.), stow factors, cargo-vehicle-facility-compartment matching, and estimated timing.

Field Name	Units	Description
1 Planning Fleet		Aggregation of fleets used for planning modes, ports, cargo configurations, and prescheduled routes
2 Fleet Mode		Transport mode used by the planning fleet
3 Transport Agent		Transportation agent or company identifier for this fleet
4 Planning Speed	nmi/hr	Nominal planning speed in nautical mph or knots for planning routes and target lift dates (this is a planning speed, not a scheduling or simulation speed, and should be set to match slower vehicles)
5 Planning Delay Hours	hr	Nominal planning delay time in hours for each mode change to allow for vehicle repositioning, loading, unloading, and other delays for planning routes and target lift dates (accounts for repositioning in planning, not just load times)
6 Planning Ton-Hour Penalty	$/hr/ton	Nominal penalty per ton per hr for transport via this vehicle type for planning routes and target lift dates
7 Plan Fleet Productivity %	% of C-mi/day	Plan fleet useful planning percent allocation or productivity %, expressed as a percent of transport lift flow capacity (Mton-mi/day, SqFt-mi/day, etc.) as contributed by the first measure of each compartment
8 Utilization Rate %	%	Vehicle effective utilization (UTE) rate expressed as a percent usage per day based on maintainability, logistics support, re-basing, non-productive use (applies to travel time only, not time in port, and cause recovery delays after trips)
9 Greedy Vehicle Wait	hr	Max wait time for evaluating additional cargo at the same POE after an assignment, used in the vehicle scheduling algorithm
10 Standard Depart Interval	day	Standard depart time interval for a prescheduled route, stored for reference only and not used to generate routes
11 Stop Arrival Tolerance	day (hr)	Time window tolerance for early or late arrival at the prescheduled stops on this route
12 Route Delay Penalty		Penalty for the delay of prescheduled stops when inserting new stops, the input value is the penalty of one day delay in cents, with increasing cost for greater delays
13 Remain On Route?	T/F	Checked or True if the prescheduled ship should stay on its prescheduled route only up through the Route Last Day, otherwise False
14 Description		Description of the prescheduled route

Figure 4-9. Data Elements for the Planning Fleet table (PlanFlt).

The planning fleets offer better control over the planning process rather than using modes alone. For example, strategic airlift and theater airlift may share the same travel links and facilities, but their capacity is assigned to very different cargo movement legs. In order for planning to see the proper allocation of airlift capacity, it may be appropriate to create two planning fleets, one for strategic airlift and one for intra-theater airlift. This avoids pooling the intra-theater airlift capacity with strategic airlift during planning, and is also useful for restricting them to specific theaters. Based on the planning fleets and their constraints, the planning algorithm then selects nodes, configurations, modes, AND planning fleets for subsequent scheduling. A similar situation occurs with multi-theater scenarios, in which different fleets of vehicles may be pre-allocated to different theaters.

As another example, the use of Fast Sealift ships may have special planning considerations different from other sealift, e.g. fast sealift may be dedicated to Army unit moves. Since planning evaluates limits on the ship capacity, it may be important to track limited Fast Sealift capacity separate from other ships during planning. Otherwise, planning does not track the use of Fast Sealift capacity as a separate lift asset distinct from other ships. The planning fleets provide additional guidance about efficiently using a limited number of special lift assets relative to high priority movements.

The use of planning fleets can increase or decrease run time. If the planning fleets have distinct constraints relative to the modes as a whole, then making planning fleets more detailed can reduce run time because capacity reservations are tracked in separate smaller lists rather than one large list for each mode. The planning fleets also reduce subsequent scheduling time, since fewer vehicle alternatives exist with each planning fleet during the scheduling process. On the other hand, the use of multiple planning fleets having similar characteristics can definitely increase planning time and unduly constrain the scheduling alternatives. In summary, the planning fleets should be used as "more detailed modes" to separate groups of vehicles that have *significantly different* deployment considerations.

4.2.9 Prescheduled Stops

Each Planning Fleet can be assigned a prescheduled stop itinerary, including cyclical liner routes that are automatically duplicated and expanded into multiple trips. Prescheduled stops are defined in the StdStop table using the data elements shown in Figure 4-10. Any prescheduled stops that are defined and associated with vehicle availability in the VehFleet table, are generated and expanded prior at the beginning of the model run and are retained in the final schedule. For example, the DOD Voluntary Intermodal Sealift Agreement (VISA) program makes uses of commercial liner routes which have preset, cyclical itineraries. Several ships in VehFleet may be assigned to the same prescheduled stops in StdStop using the Start Route Id, but with different Start Route Offset as specified in VehFleet. If the prescheduled stops are cyclical (they start and stop at the same node), then the prescheduled itinerary is automatically repeated over time until the end of the simulation, or until the Start Route Last Day specified in VehFleet.

Field Name	Description
1 Planning Fleet	Planning fleet that has prescheduled stops
2 Stop Sequence	Stop sequence number for this prescheduled planning fleet (stops are
3 Arrive Day	Arrive day offset for this prescheduled stop sequence, starting from zero (the
4 Node	Node associated with this prescheduled stop sequence number
5 Facility	Facility associated with this prescheduled stop sequence number
6 Depart Day	Depart day offset for this prescheduled stop sequence, starting from zero

Figure 4-10. Data Elements for the Standard Prescheduled Stop table (StdStop).

4.2.10 Compartment Type

A Compartment Type in the CptType table is used to represent a kind of cargo stowage capability for loading cargo on a transport vehicle. A vehicle can have multiple compartment types for loading cargo. For example, a Breakbulk ship typically has a "Deck" compartment and a "Hold" compartment, which have different cargo loading characteristics but reside on the same ship. The Compartment Type is used to define compatibility with different cargo types, units of measure for capacity calculations, and stowage factors for loading the cargo. Each Compartment Type is applicable to a single Transport Mode only, and different Compartment Types must be defined for different modes. A Compartment Type can be used on different Vehicle Types within a mode. For example, the "Deck" compartment type may be applicable to several different ship types, but if a compartment has different stow factors then it must be defined as a different Compartment Type record.

Field Name	Description
1 Compartment Type	Generic compartment type name which is associated with stow factors and vehicle capacities (e.g., Hold for ships, Outsize for aircraft, Boxcar for rail, Flatbed for motor)
2 Transport Mode	Transport mode associated with this compartment type

Figure 4-11. Data Fields for the Compartment Type table (CptType).

4.2.11 Vehicle Compartment Type

Since a vehicle can have multiple compartments, the VCptType table specifies the allowable Compartment Types for each Vehicle Type. All vehicles within a single Vehicle Type have the same Compartment Types (otherwise, a new Vehicle Type must be defined). For example, a Vehicle Type of "Breakbulk" representing breakbulk ships may have two applicable Compartment Type records, "Deck" and "Hold", as listed in the VCptType table. This means that all "Breakbulk" vehicles have the two compartment capacities listed in the VehCap table (see below), although the compartment capacity can be zero to exclude loading in those exceptions where no usable deck space exists.

Field Name	Description
1 Vehicle Type	Vehicle Type (e.g. C-5 for air; Breakbulk for sea; Van, Flatbed, Special, Refrigerated, etc. for motor; Flatcar for Rail)
2 Compartment Type	Name of an available compartment type for the vehicle type

Figure 4-12. Data Fields for the Vehicle Compartment Type Table (VcptType).

4.2.12 Compartment Measure

In order to compute the amount of cargo that can be loaded on a vehicle compartment, the capacity of the compartment must be entered in appropriate units of measure. The Compartment Measure table CptMeas is used to define which units of measure apply to each Compartment Type. A single compartment can have multiple units of measure (e.g., Mton and SqFt) either of which can be constraining depending on the volume and area density of the cargo. Depending on stow factors and the cargo quantities, one cargo may "cube out" and a different cargo may "square out" when loading the same vehicle compartment. The CptMeas table defines which measures apply. For example, a sealift "Deck" compartment may have only a single constraining unit of measure for area (SqFt), whereas an airlift "C-17" compartment may have both volume (Mton) and area (SqFt) capacity limits for the same compartment space.

The CptMeas table assigns measures to compartments based on the allowable measures in the Measure table. New measures can be defined as appropriate for use in GDAS; for example, a TEU measure can be defined to measure the capacity of "Container" compartments.

Field Name	Description
1 Compartment Type	Compartment type name used to specify stow factors for vehicle types and capacities for vehicles
2 Compartment Measure	Unit of measure for defining compartment capacity (in addition to the total Ston measure which is always used for each vehicle)

Figure 4-13. Data Fields for the Compartment Measure Table

4.2.13 Vehicle Compartment Capacity

The Vehicle Compartment Capacity table, VehCap, lists the compartment capacities for every Vehicle Data record, matching Compartment Type, and matching Compartment Measure. The user need enter only the actual capacity data. All of the records and key fields in the VehCap table are derived from the other VehData, VCptType, and CptMeas tables and are filled out automatically.

Field Name	Description
1 Vehicle Type	Vehicle type
2 Vehicle Identifier	Vehicle identifier for this vehicle data
3 Compartment Type	Compartment type for this vehicle type
4 Compartment Measure	Compartment stowage measure
5 Capacity	Stowage capacity for this vehicle compartment in the stowage measure

Figure 4-14. Data Elements for the Vehicle Capacity Table (VehCap).

4.2.14 Vehicle

The Vehicle table is derived from VehFleet and is *not* input data. The table is shown here only for reference. The GDAS scheduling model tracks each Vehicle separately, so as a first step it takes each VehFleet record and "clones" the individual vehicles based on the Number of Vehicles available. One of the outputs of the model is a complete listing of each unique Vehicle, with many of the vehicles having the same characteristics but different scheduled trips, stops, and cargos.

Field Name	Units	Description
1 Vehicle Number		Vehicle unique sequential number
2 Vehicle Type		Vehicle type
3 Vehicle Identifier		Vehicle identifier
4 Vehicle Fleet		Vehicle fleet for this vehicle
5 Attrit or Damage Day	day	Last attrit or breakdown day for this vehicle, if any
6 Replace or Repair Day	day	Last replacement or repair day for this vehicle, if any
7 Computed Course		Current course direction computed for the current date and time
8 Computed Latitude	deg min H	Current latitude computed for the current date and time
9 Computed Longitude	deg min H	Current longitude computed for the current date and time

Figure 4-15. Output Data Elements for the Vehicle Table

4.3 Transportation Network Data

Figure 4-16 provides an overview of the data tables and relationships for representing the transportation network. Once a global network is established, most of this data is again relatively stable for different studies, except when extending to intratheater analyis for a new area of the world, or when running at very

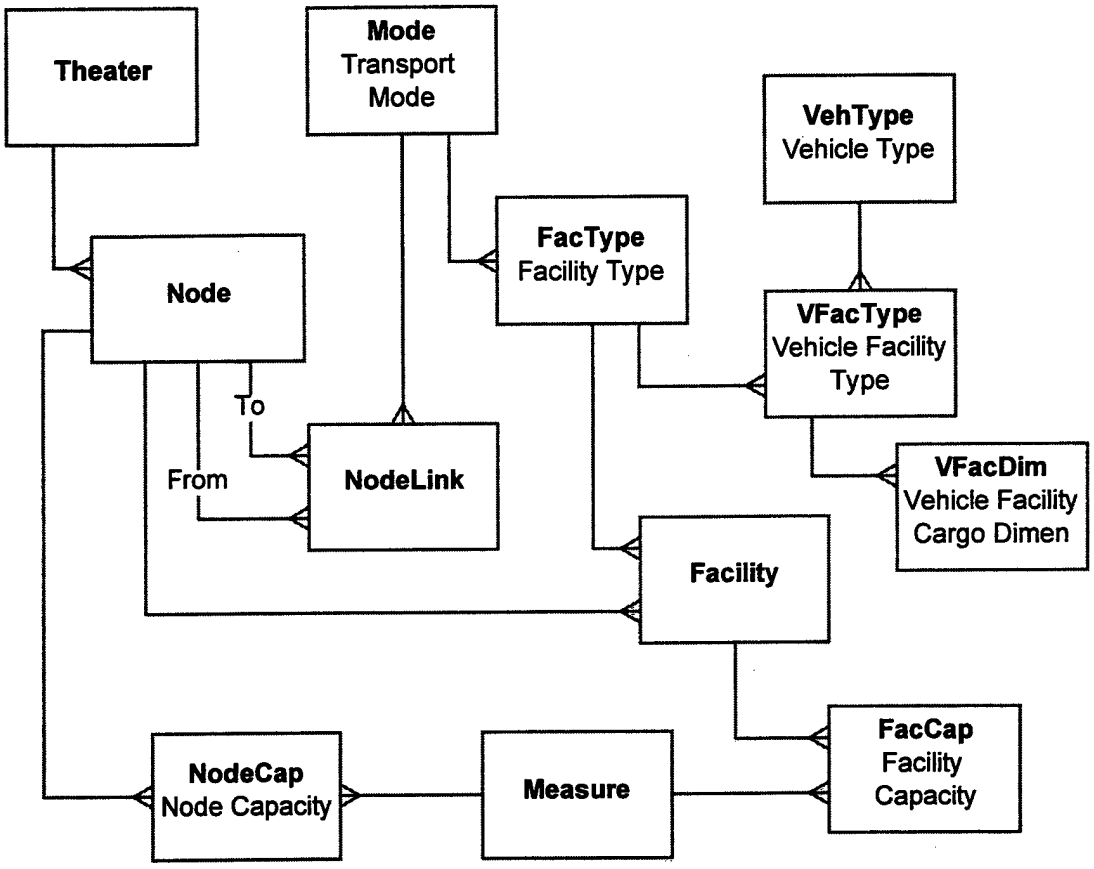


Figure 4-16. Data Tables and Relationships for Transportation Network

high level of detail with sub-networks at facilities.

4.3.1 Node

A Node is simply a location in GDAS, with a latitude and longitude. A Node may represent a port location with facilities (POE,POD,POI), an origin, a destination, a transshipment point, a turning point or waypoint, a refueling location, a canal entrance point, a staging location, an assembly point, or any other location.

Field Name	Units	Description
1 Node Name		Node name corresponding to a port, transhipment point, origin, destination, routing point etc.
2 Node Type		Node type for world map graphics display
3 Node Latitude	deg min H	Node latitude in dd mm H
4 Node Longitude	deg min H	Node longitude in ddd mm H
5 Geoloc Code		Node geoloc code, if any
6 Theater		Theater that the node is located in, if any
7 Attrit Probability %%	%%	Discrete probability of attrition or breakdown when departing this node
8 Is Node Disabled?		Yes if the node is disabled, otherwise blank

Figure 4-17. Data Elements for the Node Table

4.3.2 Node Link

A Node Link represents a transportation link from one node to another on which transport vehicles can move. Each link is assigned a single Transport Mode, so that several links may exist between the same two nodes for different transport modes. Data about the link include the From Node, To Node, Transport Mode, Link Distance (which is computed as a great circle if left blank), Added Delay Hours (e.g., for canal or other delays), Speed Change (with or against a current or wind), Speed Limit, etc. The network links are connected to form a multi-nodal route path in GDAS in the routing algorithm.

Field Name	Units	Description
1 From Node		From node name
2 To Node		To node name
3 Transport Mode		Transport mode for this link (only one link is permitted for each mode; multiple links can be created by adding nodes)
4 Is Link Disabled?		Yes if the link is available, blank otherwise
5 Link Dist	nmi	Computed link distance in miles based on great circle (can also be set by the user, but will be recalculated as the great circle distance if less than the great circle distance)
6 Added Delay Hours	hr	Delay time on this link in hours
7 Speed Change	knot	Speed change (positive for increase, negative for decrease) which is added to the transport speed on this link (for sealift an approximate calculation is to get an equivalent distance change)
8 Speed Limit	knot	Speed limit which constrains the allowable transport speed on this link (for sealift an approximated distance change is computed)
9 Link Rating		Link rating for the size of vehicles which are permitted through this link relative to the size required for a given Route Type
10 Attrit Daily Rate %%	%%/day	Attrition or breakdown rate on this link for exposure-based attrition

Figure 4-18. Data Elements for the Node Link Table (NodeLink).

4.3.3 Theater

A Theater represents a subset of nodes classified by area of the world. A Theater is assigned to each Node primarily for reporting purposes, although theater is also used to specify resupply generation factors and determine if convoying is applicable.

Field Name	Units	Description
1 Theater		Theater name
2 Mobilization M Day	day (hr)	Theater M day or begin mobilization day relative to global day 0
3 Deployment C Day	day (hr)	Theater C day or commence deployment day relative to global day 0
4 Combat D Day	day (hr)	Theater D day on which casualties and attrition begin, relative to global day 0
5 Earliest Depart Day	day (hr)	Earliest day that a vehicle can leave after exiting the POE facility before traveling towards this theater (cargo can be preloaded and the facility exited)
6 Start Planning Day	day (hr)	Day on which requirements can first start being considered for scheduling to this theater

Figure 4-19. Data Elements for the Theater Table

4.3.4 Facility

A Facility represents a loading or unloading capability at a node, for example a seaport, airport, truck terminal, or rail terminal. A node with facilities normally has more than one, such as both a truck terminal and a seaport, to permit transfer from one mode to another. All transfers of cargo onto a vehicle or off of a vehicle must occur at a facility. Origins and destinations of movement requirements must also have facilities (this is checked by GDAS). A Facility has a Facility Type, which affects which vehicle types and cargo types are compatible with the Facility and what the load/unload rates are.

Field Name	Units	Description
1 Node		Node with one or more facilities
2 Facility Name		Facility name at this node
3 Facility Type		Facility type for this facility
4 Max Vehicles Per Hour	veh/hr	Number of combined vehicle arrivals and departures which can be handled per hour in this facility during its hours of operation
5 Max Parking	veh	Maximum number of "standard" vehicles permitted in the facility at the same time, e.g. working MOG for airlift or number of berths for sealift (vehicle types are weighted by an effective factor to convert to a standard vehicle) (model scales by 100 to %)
6 Operating Hours/Day	hr/day	Operating hours per day that the facility is open
7 Facility Length	ft	Maximum length available (e.g., runway length for air, berth length for sea)
8 Facility Width	ft	Maximum width available (e.g., runway width for air, berth beam for sea)
9 Facility Dimension	varies	Maximum vehicle dimension allowed in the facility, a user-definable criterion, such as draft for sealift
10 Facility Rating	varies	Facility rating which limits the maximum allowable vehicle rating, based on a user-definable critieria (e.g., load classification number for air, boom capacity or sea)

Figure 4-20. Data Elements for the Facility Table

4.3.5 Facility Type

A Facility Type in the FacType table represents a kind of facility that can handle certain kinds of cargo and vehicle types. Each Facility Type has a single Transport Mode for which it applies, and each Facility at a node must be listed with a single Facility Type. The Facility Type affects the allowable Vehicle Types which can enter the Facility and it affects the load/unload rates for different Cargo Types.

4.3.6 Vehicle/Facility Type

The Vehicle/Facility Type records in the VFacType table specify which Vehicle Types are compatible with which Facility Types. The records and key fields are entered automatically by GDAS for all matching modes. In addition, setup and shutdown delays can be specified for vehicles entering the facility types.

Field Name	Units	Description
1 Vehicle Type		Vehicle type
2 Facility Type		Facility type with matching mode
3 Is Vehicle Excluded?	T/F	Checked or True if the vehicle type is excluded from loading and unloading cargo at this facility type, otherwise False (vehicle may still refuel unless prevented by Is Refuel Excluded? field)
4 Setup Delay	hr	Fixed setup or entrance delay time for this vehicle type while occupying this facility type (the vehicle takes parking space and the facility must be open during setup; setup delays vehicle and cargo loading/unloading)
5 Shutdown Delay	hr	Fixed shutdown or exit time for this vehicle type while occupying this facility type (the vehicle takes parking space and the facility must be open during shutdown; shutdown delays vehicle but not cargo loading or unloading)
6 Facility Visit Penalty	$/visit	Penalty for multi-facility visits on a single trip, used in the scheduling algorithm (the first POE and POD facilities on a new trip are not penalized)

Figure 4-21. Data Elements for the Vehicle Facility Type Table (VFacType).

4.3.7 Vehicle/Facility Cargo Dimension

The Vehicle/Facility Cargo Dimension table, VFacDim, lets you set cargo dimension limits that constrain the capabilities of different Vehicle Types for loading/unloading cargo at the specified Facility Types. This table is useful only if the cargo measures include dimension limits such as Max Height or Max Length and you wish to set limits on what dimension limits are compatible with different Vehicle Types and Facility Types.

Field Name	Units	Description
1 Vehicle Type		Vehicle type with cargo dimension constraint
2 Facility Type		Matching facility type with cargo dimension constraint
3 Max Dimension Measure		Cargo dimension constraint measure (Item Height Ft, Item Weight Ston, etc.)
4 Max Cargo Dimension	ft,ston, mton, etc.	Cargo dimension limit to exclude cargo that is too big from loading on this vehicle type at this facility type

Figure 4-22. Data Elements for the Vehicle Facility Type Dimension Table (VFacDim).

4.3.8 Facility Capacity

Each Facility at a Node can be constrained by one or more throughput and storage capacities as specified in the Facility Capacity table, FacCap. Each Facility Capacity record is entered for user-specified throughput measures such as Mton/Hr, SqFt/Hr, or Ston/Hr, or storage measures such as SqFt Storage. Multiple constraint measures and capacities can be entered and enforced simultaneously for a single Facility. Note that different kinds of cargo can utilitize facility capacity at different rates for different Vehicle Types (see the LoadRate table).

Field Name	Units	Description
1 Facility Node		Node with one or more facilities
2 Facility Name		Facility name at this node
3 Facility Capacity Measure		Cargo storage or throughput handling capacity measure for this facility
4 Facility Capacity	Q/hr	Hourly rate or total storage cargo handling capacity for this measure and facility at the node

Figure 4-23. Data Elements for the Facility Capacity Table (FacCap).

4.3.9 Node Capacity

Similar to Facility Capacity, each Node can be constrained by one or more throughput and storage capacities as specified in the Node Capacity table, NodeCap. The difference between a Node Capacity and a Facility Capacity is that the Node Capacity is a shared constraint applied to all facilities at the Node,

whereas the Facility Capacity applies to a single Facility only. Thus, the Node Capacity is useful when shared resources (such as stevedores or forklifts) are used for loading/unloading across multiple facilities, possibly across several modes. Each Node Capacity record is entered for user-specified throughput measures such as Mton/Hr, SqFt/Hr, or Ston/Hr, or storage measures such as SqFt Storage. Multiple constraint measures and capacities can be entered and enforced simultaneously for a single Node.

Field Name	Units	Description
1 Node Name		Node having throughput or storage limits
2 Node Capacity Measure		Unit of measure for overall cargo handling capacity at the node
3 Total Node Capacity	Q/hr	Hourly throughput rate or total storage cargo handling capacity at the node for all facilities combined

Figure 4-24. Data Elements for the Node Capacity Table (NodeCap)

4.4 Movement Requirements Data

Figure 4-25 provides an overview of the data tables and relationships for representing movement requirements. Again, most of the data is static "type" data to set up the basic cargo categories and units of measure. The primary tables that are filled in for a given study are the movement requirements (Require), their quantities (ReqQuan), and any required nodes (ReqNode).

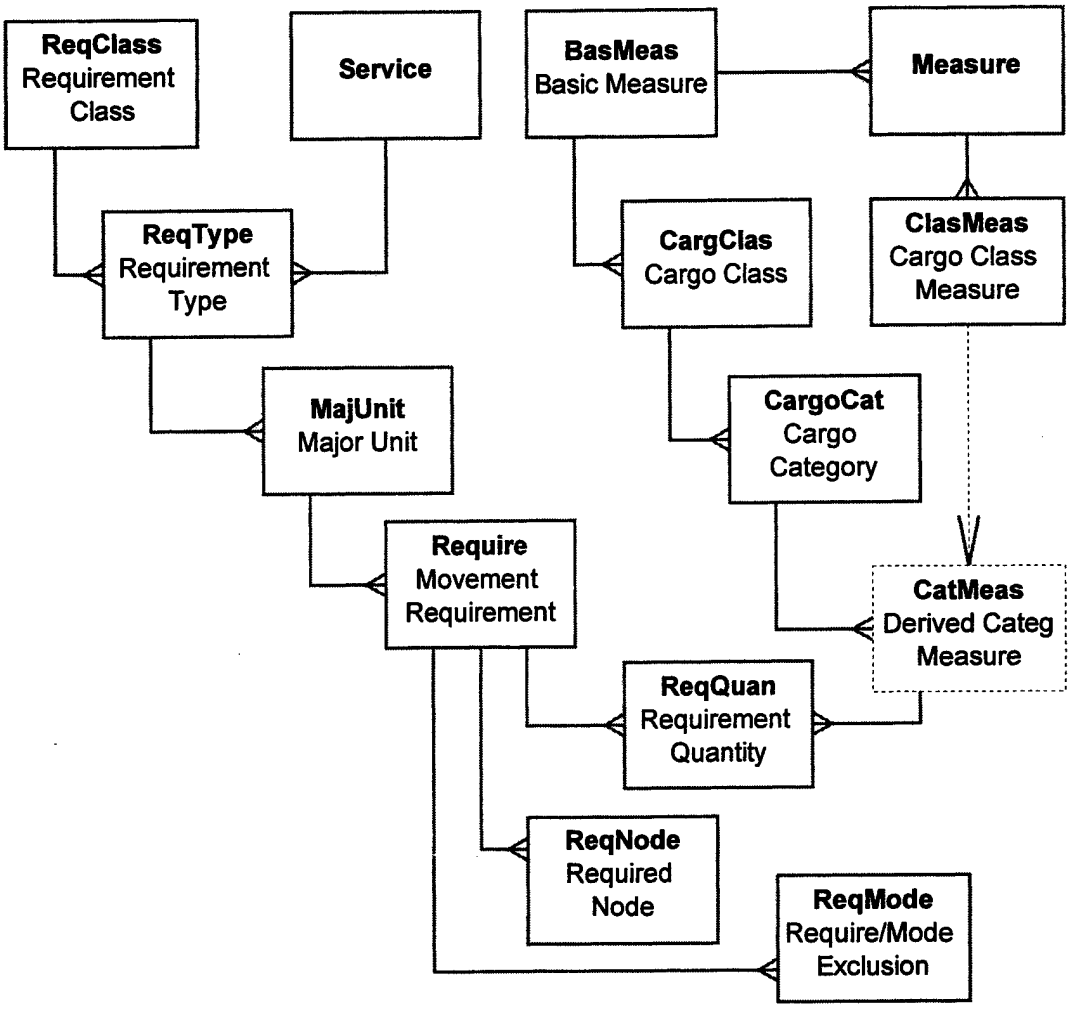


Figure 4-25. Data Tables and Relations for Movement Requirements

4.4.1 Movement Requirement

The Movement Requirement provides the basic data about what is to be moved where and when. Each Movement Requirement is listed in the Require table with a Requirement Id, an Origin node, a Destination node, a Ready to Load Day (RLD), and a Required Delivery Day (RDD). A single Movement Requirement can constitute a package of multiple items with different cargo categories.

Field Name	Units	Description
1 Requirement Id		Movement requirement or package id
2 Major Unit		Major unit associated with this movement requirement
3 Origin		Starting origin of the requirement
4 Destination		Final destination of the requirement
5 RLD	day	Ready to load day or earliest day the requirement is available at its origin
6 RDD	day	Required delivery day of the packaged requirement at its destination including time for assembly
7 EDD	day	Earliest allowed delivery day of the requirement at its destination prior to assembly
8 Computed Closure Day	day	Closure day for the requirement based on the closure minimum % requirement specified in the ReqType table
9 Priority Order		Relative priority order for this requirement as a secondary sort after the Target Lift Date (one means first priority in assigning lift assets, blank defaults to the priority order of the requirement type)

Figure 4-26. Data Elements for the Movement Requirement Table (Require).

4.4.2 Cargo Category

A Cargo Category provides the most detailed representation in GDAS of the kind of cargo to be transported. In many cases, the GDAS Cargo Category corresponds to JOPES three-digit cargo category codes, perhaps with the addition of some cargo categories for higher resolution in intratheater studies. A single Movement Requirement may incorporate multiple cargo categories as part of a unit movement package from origin to destination. Each Cargo Category uses a set of quantity measures (Mton, Ston, SqFt, Cbbls, etc.) that are applicable based on the Cargo Class as set up in the ClasMeas table.

The CargoCat table has a new field called "Discrete Load Increment". This field is used to specify a smallest increment of basic quantity size, below which the cargo cannot be split. For example if some tracked vehicle category has no vehicle which weighs less than 10 short tons, then when you place a 10 in this field, no cargo of this category will be split into any size other than a multiple of 10. If the original requirement quantity is not an even multiple of 10, there may still be a final split cargo that cannot be a multiple of 10, but when GDAS subdivides any quantity it will create a quantity which is a multiple of 10. The Discrete Load Increment is also honored when GDAS splits cargo among compartments in a multi-compartment vehicle. Thus, each compartment will hold a quantity that is an even multiple of the the discrete load increment, except perhaps the last cargo assigned if the original requirement quantity does not start out as an even multiple.

Each Cargo Category can also have special ammunition handling, which requires that ammo be last-on, first-off in routing.

Field Name	Units	Description
1 Cargo Category		Cargo category which describes the kind of cargo being transported
2 Cargo Class		Cargo class (Dry, Pax, POL) which defines dimensional measures for this cargo category
3 Category Code		Four position JOPES cargo category code including heavy lift code (A0=vehicle NAT, B0=NSDA NAT, B1=NSDA outsize, B2C=NSDA oversize noncont, etc.)
4 Discrete Load Increment	Q	Discrete size increment for loading this cargo, expressed in the basic unit of measure; if specified, a split cargo must be an integer multiple of the size increment
5 Configuration at Origin		Starting cargo configuration at the origin for this cargo category
6 Is Ammunition?	T/F	Checked or True if the cargo category is treated as hazardous ammunition in route sequence, i.e. it is constrained to be last on and first off in multi-port routes, otherwise False
7 Description		Description of the cargo category

Figure 4-27. Data Elements for the Cargo Category Table (CargoCat).

4.4.3 Cargo Class

The Cargo Class table, CargClas, is an abstract table that is used to identify what units of measure apply for the different cargo categories. The typical Cargo Classes in GDAS are as follows:

- "Dry", which uses Ston, Mton, and SqFt measures
- "Pax", which uses Pax (the number of passengers) as the only measure
- "POL", with Cbbls as the only measure
- "TEU", with Ston, Mton, SqFt, and TEU as measures.

Of course, these Cargo Classes can be extended or revised in the database for a particular study application. Note that in the figure, the notation "Q" refers to the Basic Quantity Measure specified in field 2.

Field Name	Units	Description
1 Cargo Class		Cargo class (Dry, Pax, POL) which defines dimensional measures for cargo
2 Basic Quantity Measure		Basic unit of measure for reporting quantity of this cargo class (ston, pax, cbbl)
3 Pounds Per Basic Quantity	lbs/Q	Pounds per unit basic quantity in the basic unit of measure, used for conversion to accumulate ston weight totals for vehicle loading or facility throughput
4 Has Accompanying Pounds?	lbs/Q	Yes if theater-dependent accompanying pounds per unit basic quantity are obtained from the THTRREQ table rather than a conversion factor (otherwise Pounds Per Basic Quantity field is used)
5 Is Pax?		Yes if the cargo class represents passengers, used to compute closure based on the MAJUNIT % closure criteria

Figure 4-28. Data Elements for the Generic Cargo Class Table (CargClas), where Q is the Basic Quantity Measure.

4.4.4 Cargo Class Measure

The Cargo Class Measure table, ClasMeas, lists which measures apply to each Cargo Class. For example, "Dry" movement requirements utilize all three units of measure for loading of cargo onto vehicles, so that the movement requirement quantities are listed using all three three measures. The Cargo Class Measures can be changed to configure GDAS for different levels of detail, ranging from highly aggregated Ston flows down to detailed line items with Max Height, Max Length, and Max Width as well as area, volume, and weight.

Once the ClasMeas table is established, GDAS automatically derives the CatMeas table, which lists the valid quantity measures for each Cargo Category. This serves as a reference lookup table in editing the Movement Requirement Quantities in ReqQuan (described in Section 4.4.6).

Field Name	Description
1 Cargo Class	Cargo class (Dry, Pax, POL) which defines dimensional measures for cargo
2 Cargo Measure	Type of measure used for specifying quantity or dimension of cargos in this cargo class

Figure 4-29. Data Elements for the Cargo Class Measure Table (ClasMeas).

4.4.5 Basic Quantity Measure

Each Cargo Class is assigned a special measure that is the Basic Quantity Measure, as shown earlier in Figure 4-28. The "Sample" database scenario assigns Ston as the basic measure for the Dry Cargo Class, Cbbl for POL Cargo Class, and Pax for Pax Cargo Class. Since the quantity measure varies, it is listed generically as Q in the Dictionary units column. The Basic Quantity Measure is used in the model to specify the discrete cargo load quantities on vehicles and is also used for most reports. In addition, the Basic Quantity Measure represents the smallest discrete size allowed for cargo splits. This property can be used to advantage to represent discrete cargo increments such as Pax, Containers, or even discrete items such as Tanks by adding the appropriate Basic Quantity Measure.

4.4.6 Movement Requirement Quantities

Each Movement Requirement has associated with it one or more Quantity records in the ReqQuan table. These Quantities specify both the Cargo Categories and the matching units of measure. For example, a single unit movement may have a Pax cargo category measured in Pax only, as well as several Dry cargo categories (containerizable breakbulk, non-containerizable outsize, etc) each measured in Ston, Mton, and SqFt quantities.

Field Name	Units	Description
1 Requirement Id		Requirement identifier for the cargo
2 Cargo Category		Cargo category, e.g. oversize containerizable vehicle, Pax, NEO, Medivac, etc.
3 Cargo Measure		Dimensional measure for this requirement and cargo category
4 Quantity	Q	Requirement category quantity or dimension in this unit of measure

Figure 4-30. Data Elements for the Requirement Quantity Table (ReqQuan).

4.4.7 Requirement Class, Requirement Type, Major Unit, Service

Several levels of aggregation are available to represent the type of movement requirements, primarily for reporting totals. Each Movement Requirement has a Major Unit in the MajUnit table, which specifies the functional type or purpose of the movement (e.g., a TPSN in the Army environment, or some other study-specific identifier). The Major Unit is used in the reporting and charting tools to display total delivery profiles with required versus delivered quantities by day. The Major Unit is also used for assigning Measure of Effectiveness in certain output reports.

Field Name	Units	Description
1 Major Unit		Major unit name for analysis of requirement closures and measures of effectiveness
2 Major Unit TPSN		Major unit Troop Program Sequence Number (TPSN) or other user-defined identifier for the major unit
3 Requirement Type		Requirement type for this major unit
4 Major Unit MOE		Measure of effectiveness (MOE) rating for this major unit (e.g., brigade count or combat power) as defined by the analyst to compute cumulative MOE delivery
5 Computed Closure Day	day	Closure day for the major unit based on both the Pax and cargo closure minimum % specified in the ReqType table
6 Closure Required Cargo %	%	Minimum percent of the cargo which must be delivered in order to calculate unit closure (if the % is never attained, closure is based on the last portion delivered)
7 Closure Required PAX %	%	Minimum percent of the passengers which must be delivered in order to calculate unit closure (if the % is never attained, closure is based on the last portion delivered)
8 Major Unit Description		Major unit description

Figure 4-31. Data Elements for the Major Unit Table (MajUnit).

At a higher level of aggregation, each Major Unit is assigned a Requirement Type in the ReqType table. The Requirement Types are used to set scheduling priorities and penalties for the model.

Field Name	Units	Description
1 Requirement Type		Requirement type or unit type
2 Requirement Class		Aggregated requirement class for calculating summary cargo delivery versus required totals for reports
3 Service		Service for this requirement type or unit type
4 Planning Horizon Days	day (hr)	Planning or look-ahead horizon in days for scheduling cargos of this requirement type prior to their target lift date
5 Assembly Delay Days	day (hr)	Additional assembly delay days needed after delivery at the destination used to calculate closure and lateness relative to the RDD
6 RLD Packaging Range	day (hr)	Packaging range for merging movements with similar Ready to Load Dates (RLDs)
7 RDD Packaging Range	day (hr)	Packaging range for merging movements with similar Required Delivery Dates (RDDs)
8 RDD Tolerance	day (hr)	Days tolerance for lateness at the destination relative to the RDD before mode planning increases delivery cost to reduce lateness
9 Max Days Late	day (hr)	Days late relative to the target delivery date beyond which a cargo is rejected in scheduling and is reported with rejection reasons, even if the penalty is acceptable
10 Cargo Lateness Penalty	.01$/Q-day	Penalty for cargo ton-days of lateness (as compared with vehicle usage penalties) in the scheduling algorithm
11 Penalty/Benefit Cut-off	$/$	Cost cut off level above which a potential cargo assignment is rejected early in the multi-port scheduling algorithm (blank or a large value means no cutoff)
12 Early Assignment Level	$/$	Threshold penalty/benefit level below which a potential cargo/ship assignment is accepted immediately in the multi-port scheduling algorithm (a large value reduces run time but may make a selection before costing a preferred vehicle)
13 Regeneration Delay Days	day (hr)	Nonzero delay days to regenerate attritted cargo for this requirement; cargo is regenerated with the same data as the original movement (blank means no regeneration)
14 Default Priority Order		Default priority order for this requirement type if not specified for a given requirement (1 is the earliest priority order; blank is treated as no priority or as 99)
15 Minimum Cargo Load %	%	Minimum % split of a single cargo (i.e. requirement+category) for assigning to a separate non-airlift trip (not used for airlift; 100% prevents any non-airlift splitting; this is separate from the Minimum Cargo Load % and Minimum Vehicle Load % in Param)
16 Integrity Benefit	day (hr)	Wait days benefit indicating a preference for loading identical Requirement Id's onto the same vehicle trip
17 Is Resupply?		True or checked if this requirement type is dynamically ordered by other requirements in the theater, when dynamic resupply is being modeled

Figure 4-32. Data Elements for the Requirement Type Table (ReqType).

At yet a higher level of aggregation, each Requirement Type is assigned a general Requirement Class (e.g., "Unit" versus "Resupply") and a Service. The Requirement Class is used solely for summary reports and charts, such as total "Unit" requirements delivered by day. In addition, the Requirement Type is assigned a unique Service (Army, Navy, USMC, Air Force, etc.), again for reporting purposes.

4.4.8 Required Node, Require/Mode Exclusion

The Required Node records in the ReqNode table are used to pre-assign intermediate POEs and PODs for a Movement Requirement. For a given study, it may be necessary to specify the POEs and PODs based on external study inputs or staging requirements, rather than allowing the model to select POEs and PODs from Origin to Destination using the GDAS mode planning algorithm.

Field Name	Units	Description
1 Requirement Id		Movement requirement identifier with intermediate ports or staging
2 Cargo Class		Cargo class for which the required node applies
3 LAD	day (hr)	Latest arrival day at this required port node (the LAD is used to determine the order in which required nodes are visited)
4 EAD	day (hr)	Earliest arrival day at this required port node, if any
5 Required Node		Required intermediate POE/POD node or port for this movement requirement
6 Required Mode to Node		Required transport mode specified for delivery to the intermediate node, if any (blank permits the use of any mode for delivery)
7 Required Config to Node		Required configuration specified for delivery to the intermediate node, if any (blank permits the use of any configuration)
8 Stage Name		Staging deployment name if multiple requirements are staged together at this node (the STAGE record must have the same node as in REQNODE)
9 Description		Description of this intermediate node, e.g. consolidation, container stuffing, mode change, re-configuration, combat loading, etc.

Figure 4-33. Data Elements for the Required Node Table (ReqNode).

Similarly, the ReqMode table lists excluded modes for different Movement Requirements and Cargo Classes. Typically, mode exclusions depend on the Cargo Class, e.g. Dry may exclude Airlift modes (traveling on Road, Rail, and Sealift) whereas Pax may exclude Sealift (traveling on Road, Rail, and Airlift).

Field Name	Units	Description
1 Requirement Id		Movement requirement having a mode exclusion
2 Cargo Class		Cargo class for which the mode exclusion applies
3 Excluded Mode		Excluded mode for this requirement and cargo class

Figure 4-34. Data Elements for the Requirement Mode Exclusion Table (ReqMode).

4.5 Loading Characteristics

Figure 4-35 provides an overview of the data tables and relationships for loading characteristics. Most of these tables have been discussed above; only the five lower right tables are new. All of this data is generic "type" data that typically does not change for different studies.

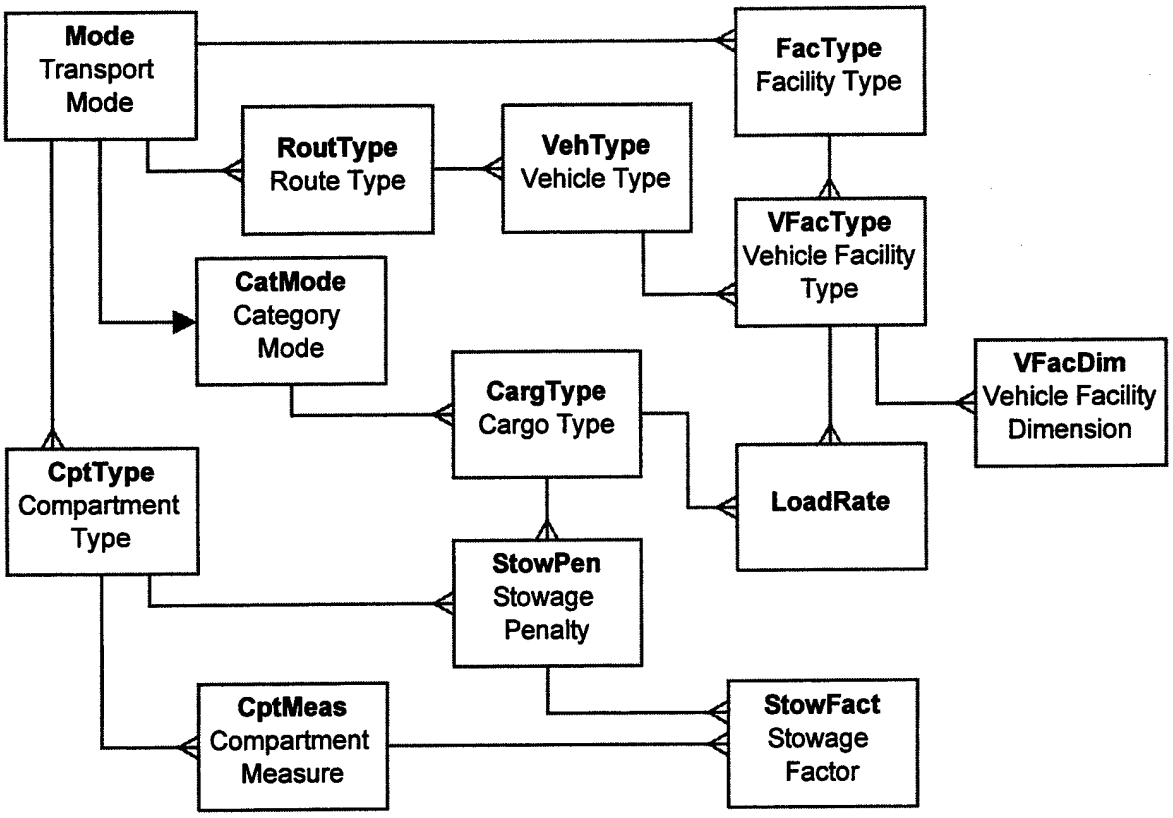


Figure 4-35. Data Tables and Relationships for Loading Characteristics

4.5.1 Cargo Type

A Cargo Type in the CargType table represents an aggregation of the Cargo Category for a specific Transport Mode. The Cargo Type is sufficient to determine the loading characteristics for a given Mode. For the Airlift mode, as an example, numerous Cargo Category records can be mapped to just four Cargo Types consisting of Bulk, Oversize, Outsize, and Pax. For the Airlift mode, only these Cargo Types are relevant in determining the loading characteristics. By expressing the loading characteristics in terms of Cargo Types rather than the more detailed Cargo Categories, far fewer stow factors, load/unload rates, and compartment matching rules need be entered.

Each Cargo Type is assigned a Cargo Class to identify which quantity measures are applicable to the Cargo Type.

Field Name	Description
1 Cargo Type	Mode-specific cargo type which groups cargo categories for a given transport mode in order to define stow factors, load rates, and load compatibility for vehicle compartments
2 Cargo Class	Cargo class (Dry, Pax, POL) for this cargo type, which defines which dimensional measures are applicable for this cargo type
3 Transport Mode	Transport mode associated with this mode-specific cargo type
4 Cargo Type Description	Description of the mode-specific cargo type

Figure 4-36. Data Elements for the Cargo Type Table (CargType).

4.5.2 Category Mode

The Category Mode table, CatMode, specifies how the Cargo Categories map to Cargo Types for each Transport Mode. The key fields and records are pre-computed by GDAS; the user need enter only the matching Cargo Type if the Cargo Category can be transported by a particular Transport Mode for a particular Cargo Configuration. Some Cargo Categories cannot be transported by some modes, for example Non-Air-Transportable (NAT) on Airlift.

Field Name	Units	Description
1 Transport Mode		Transport mode
2 Cargo Category		Cargo category which describes the kind of cargo being transported
3 Cargo Configuration		Cargo configuration status
4 Cargo Type		Cargo type used to represent this cargo category and configuration for the

Figure 4-37. Data Elements for the Category Mode Table (CatMode).

4.5.3 Stow Penalties, Stow Factors

The StowPen table specifies which Compartment Types can load which Cargo Types. Its records are also pre-generated by GDAS, and only the compatibility setting and stow penalties need be entered.

Field Name	Units	Description
1 Compartment Type		Vehicle compartment type
2 Cargo Type		Cargo type with matching transport mode for this compartment
3 Is Stow Excluded?		Yes if this cargo type is excluded from stowage in this compartment type
4 Stow Penalty	$/Q	Stow penalty per unit basic quantity of cargo for loading into this vehicle compartment

Figure 4-38. Data Elements for the Stow Penalty Table (StowPen).

The StowFact table stores stow factors for each combination of Compartment Type, Compartment Measure, and Cargo Type. Different capacity measures (Mton, SqFt, Ston, etc.) can have different stow factors. If a stow factor is set to zero or blank for an compartment measure, then loading is excluded.

Field Name	Units	Description
1 Compartment Type		Compartment type
2 Compartment Measure		Compartment stowage measure
3 Cargo Type		Cargo type for a specific transport mode
4 Stow Factor %	Q/100C	Stow efficiency in percent for loading the cargo type in the compartment type for this measure, including basic quantity conversion if the cargo measures don't match, expressed in % Q/C (i.e., cargo quantity stowed per 100 compartment capacity measure)

Figure 4-39. Data Elements for the Stow Factor Table (StowFact).

4.5.4 Load Rates

The LoadRate table specifies the load and unload rates for different combinations of Vehicle Type, Cargo Type, and Facility Type. If a load rate or unload rate is set to zero or blank, then no loading is permitted for that combination. The Load Rate table also specifies the scale factor for utilization of facility throughput capacity. For example, some Cargo Types (such as Container) may have faster unload rates as well as lower throughput utilization for suitable Facility Types and Vehicle Types (Container ships).

Field Name	Units	Description
1 Vehicle Type		Vehicle type
2 Facility Type		Facility type at the node
3 Cargo Type		Cargo type for the transport mode
4 Hourly Load Rate	Q/hr	Hourly load rate to load this cargo category grouping on this vehicle type at this berth type expressed in the cargo basic quantity units (loading can occur only during the facility open hours)
5 Hourly Unload Rate	Q/hr	Hourly unload rate to unload this cargo category grouping on this vehicle type at this berth type expressed in the cargo basic quantity units (unloading can occur only during facility open hours)
6 Cargo Throughput Scaling	%	Cargo throughput scaling which adjusts the cargo's required facility and node throughput capacity (100% represents standard throughput scaling, 0% means the cargo does not affect throughput capacity at all, 50% means the cargo consumes half throughput)

Figure 4-40. Data Elements for the Load Rate Table (LoadRate).

4.5.5 Exclusions

The Exclude table is a powerful tool to exclude specific combinations of cargo loading based on multiple criteria.. Exclusions within the Exclude table do not apply to routing or refueling between POEs and PODs, which are accomplished through the use of the RoutType table. The Exclude table applies to loading or unloading. By entering a Requirement Type, Vehicle Fleet and Theater, for example, all loading of that Requirement Type on that Vehicle Fleet is excluded in that Theater.

If exclusions can be specified in terms of stowage constraints or cargo/vehicle/facility type matching, they should be entered using zero stow factors and/or load rates, which are more efficient than the Exclude table. For example, the VFacType table can exclude a vehicle from a facility, the StowPen table can exclude cargo types from a compartment, and the LoadRate table can exclude combinations of Vehicle Type, Facility Type, and Cargo Type. The Exclude table should be reserved for customized exclusions that cannot be represented using the standard "type" data. For example, the Exclude table is often used to prevent selected Vehicle Fleets from loading specific Requirement Types.

Field Name	Description
1 Exclusion Label	Label for a user-defined combination of factors to exclude cargo loading at POEs and unloading at PODs
2 Node Excluded for Loading	Excluded node for loading and offloading, if any (blank if not applicable, i.e., this exclusion applies to all nodes and is independent of node)
3 Facility Type Excluded	Excluded facility type for loading and offloading, if any (blank if not applicable, i.e. exclusion record applies to all facility types or is independent of facility type)
4 Requirement Type Excluded	Excluded requirement type, if any (blank if not applicable)
5 Vehicle Type Excluded	Excluded vehicle type, if any (blank if not applicable)
6 Planning Fleet Excluded	Excluded planning fleet, if any (blank if not applicable)
7 Theater Excluded	Excluded theater, if any (blank if not applicable)
8 Cargo Category Excluded	Excluded cargo category, if any (blank if not applicable)
9 Mode Excluded	Excluded transport mode, if any (blank if not applicable)

Figure 4-41. Data Elements for the Exclude Table.

4.6 Basic Data Table Outputs

The primary outputs of the GDAS simulation model are the vehicle schedules and the cargo loads. The basic database tables which store this data are shown in the diagonal boxes with solid lines in Figure 4-42.

Other directly related input tables are shown in boxes with dashed lines. The basic table hierarchy along the diagonal shows that each Vehicle can make multiple Trips; each Trip can have multiple pickup and delivery Stops at node facilities; each Stop can have multiple Cargos for loading or unloading; and each Cargo can have multiple Cargo Loads on different Vehicle Compartments.

Unlike the database input tables, the basic model output data tables are keyed on an arbitrary record number identifier. Thus vehicles, trips, stops, and cargos are each identified by a unique number.

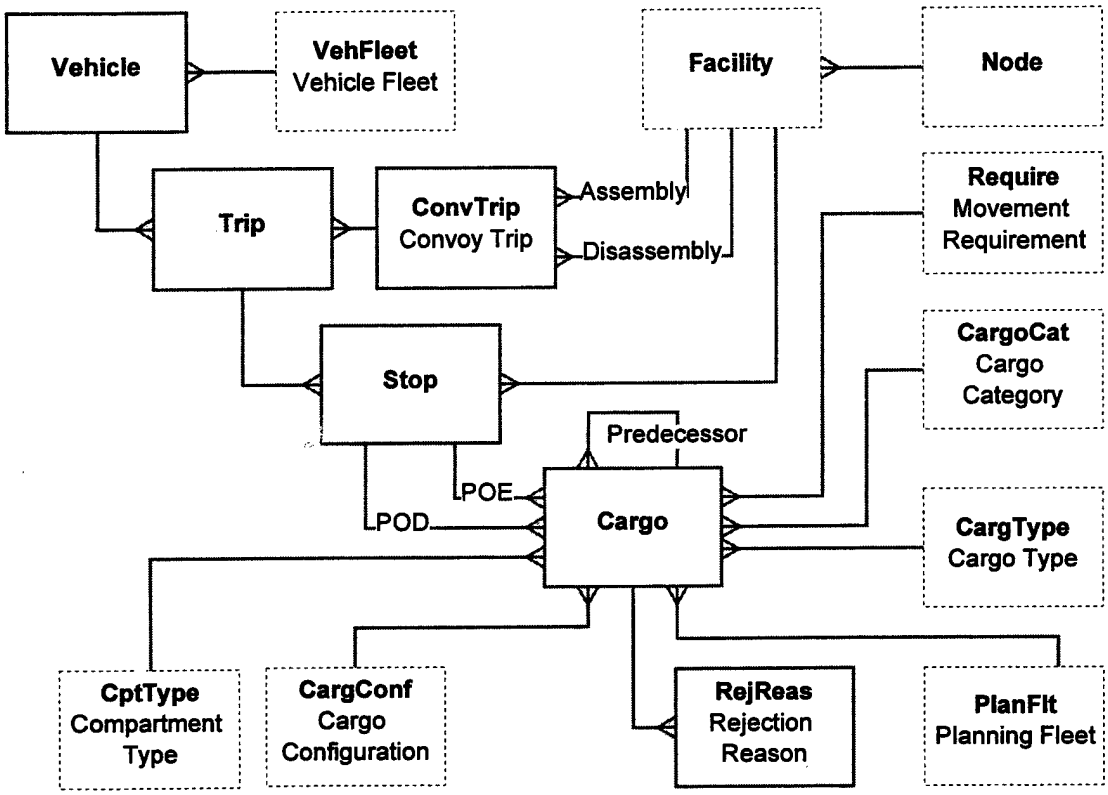


Figure 4-42. Basic GDAS Output Tables for Vehicle Schedules and Cargos

4.6.1 Vehicle

The Vehicle table is derived from the VehFleet table and is an output, not an input. The GDAS scheduling model tracks each Vehicle separately, so as a first step it takes each VehFleet record and "clones" the individual vehicles based on the Number of Vehicles available. One of the outputs of the model is a complete listing of each unique Vehicle with its unique Vehicle Number. Many of these vehicles have the same characteristics (as specified in the VehFleet, VehData, and VehType tables) but are scheduled on different trips, stops, and cargos.

Field Name	Units	Description
Vehicle Number		Vehicle unique sequential number
Vehicle Type		Vehicle type
Vehicle Identifier		Vehicle identifier
Vehicle Fleet		Vehicle fleet for this vehicle
Computed Latitude	deg min H	Current latitude computed for the current date and time in the Param table
Computed Longitude	deg min H	Current longitude computed for the current date and time in the Param table

Figure 4-43. Output Data Elements for the Vehicle Table.

4.6.2 Trip

A Trip in GDAS is defined as a sequence of two or more port Stops in which the Vehicle starts out empty, travels to multiple pickup and delivery ports, and finishes empty with no cargo onboard. Thus, a Trip represents a voyage for sealift or a flight for airlift. Each trip has an itinerary consisting of at least two Stops.

Field Name	Description
1 Trip Number	Trip number
2 Vehicle	Vehicle assigned to this trip
3 Convoy Trip Number	Convoy trip number this voyage is assigned to, if any (if a trip has multiple convoys between different stops, only the last convoy trip is stored here)
4 Number of Vehicle Trips	Number of vehicle trips assigned to this trip

Figure 4-44. Output Data Elements for the Trip Table.

4.6.3 Stop

A Stop represents a POE or POD port visit on a trip. A Stop occurs at a single Facility in which a Vehicle performs loading or unloading of cargos, but not both. (If a trip has both loading and unloading at a single port, multiple Stop records are created at that port.) Each stop has one or more Cargos for loading or unloading. Each Cargo has exactly two stops, one for loading and one for unloading.

A Stop has an arrival and departure time, which is tracked by hour in the model but stored as Days in the database. This permits the model to evaluate the cumulative effects of hourly differences such as load rates, but the output schedules are reported by Day consistent with the accuracy of the data inputs. Currently, all of the data inputs for Ready to Load Day (RLD), Required Delivery Day (RDD), Vehicle Start Day, etc. are accurate only to the nearest day, not to the hour.

Field Name	Units	Description
1 Stop Number		Unique stop number for this port or node facility visit
2 Arrive Day	day	Arrive day at the stop port if a facility is available (the actual arrive day can be delayed further by facility constraints)
3 Node		Node at which the stop is made
4 Facility Name		Port or node facility at which the stop is made, if node is an airport or seaport
5 Depart Day	day	Depart day from the stop port
6 Is Unload?		"Yes" flag to indicate that a stop is for unloading, otherwise blank
7 Hours Wait for Facility	hr	Hours vehicle spent waiting for port facilities and throughput capacity to arrive or depart
8 Trip Number		Trip number associated with this stop

Figure 4-45. Output Data Elements for the Stop Table

4.6.4 Cargo

A Cargo represents all or part of a single Movement Requirement and Cargo Category that is loaded onto one Vehicle Trip. A Cargo is associated with a unique Movement Requirement, Cargo Category, and Cargo Type. The Quantity of the Cargo is specified in the Basic Quantity Measure (Ston, Cbbl, Pax, TEU, etc.) for its Cargo Category. Each Cargo is loaded into one Vehicle Compartment at one POE Stop and unloaded at one POD Stop, possibly in conjunction with other Cargos at the same Stop or on the same Trip. Each Cargo has one Predecessor Cargo for the previous Transport Mode, except for the initial pickup at the Origin Node. Each Cargo can be split into one or more Successor Cargos for the next Transport Mode, except for the final delivery to the Destination Node. Successors are identified from Predecessor linkages.

Field Name	Units	Description
1 Cargo Number		Cargo or shipment number
2 Requirement Id		Requirement identifier for this cargo
3 Cargo Category		Cargo category which describes the kind of cargo being transported
4 Cargo Configuration		Cargo configuration which is used to package the cargo for transport on one or more modes
5 Cargo Type		Cargo type for this cargo
6 Load Stop Number		Load stop number for this cargo (in the model after planning prior to scheduling, this is the node number)
7 Unload Stop Number		Unload stop number for this cargo (in the model after planning prior to scheduling, this is the node number)
8 Cargo Basic Quantity	Q	Cargo quantity in the basic unit of measure for its cargo class (ston, pax, cbbl)
9 Compartment Type		Vehicle compartment into which this cargo was loaded
10 Begin Load Day	day (hr)	Day that the cargo begins loading (in the model prior to simulation, this is the earliest possible load time based on RLD or predecessor cargo or earliest theater depart minus 10)
11 End Load Day	day (hr)	Day that the cargo completes loading (in the model prior to simulation this is the target lift time or planned begin load time)
12 Begin Unload Day	day (hr)	Day that the cargo begins offloading (in the model prior to simulation, this is also the earliest possible unload time based on EDD for final destination cargos)
13 End Unload Day	day (hr)	Day that the cargo is scheduled to complete offloading (this is updated during planning, scheduling, and simulation)
14 Is Attritted?	T/F	Checked or True if the cargo is attritted in the last run results, otherwise False
15 Attrit Probability %%	%%	Calculated cumulative probability of attrition (in %% or ten thousandths) for the cargo based on its route and schedule and including the probability of attrition of prior cargos
16 Cargo Predecessor		Unique predecessor cargo which immediately precedes this cargo and carries the same requirement (zero for an origin cargo)
17 Cargo Split Id		Cargo split identifier consisting of the Requirement Id as prefix, followed by each successive Cargo Number which precedes this Cargo Number
18 Planning Fleet		Planning fleet selected by mode planning to move the cargo
19 Is Final?	T/F	Checked or True if cargo is the last leg to the final destination
20 Order Number		An order number that is assigned if the cargo is a resupply record, matching an order in RptSupSt

Figure 4-46. Output Data Elements for the Cargo Table

4.6.5 Rejection Reason

Some Cargos may not be successfully planned or scheduled by the GDAS model. These Cargos are listed in the Rejection Reason table, RejReas, together with a list of rejection reasons and frequency. This is extremely useful in identifying data problems or scenario difficulties which prevent successful delivery.

Field Name	Description
1 Cargo Number	Cargo number that is delayed or rejected
2 Rejection Type	Rejection reason type
3 Rejection Count	Count of rejections for this cargo and rejection reason type

Figure 4-47. Output Data Elements for the Rejection Reason Table (RejReas).

4.6.6 Convoy Trip

GDAS has the ability to model convoy operations between Theaters, normally used for Sealift. If convoying is performed, then several Vehicle Trips may be assigned to a single Convoy Trip with its associated escorts. These Convoy Trips are listed in the ConvTrip table.

4.6.7 Generation of Reports

Numerous other derived tables are generated to provide both summary and detail reports. The detail reports include Vehicle Stop Itineraries (RptStop), Vehicle Stop Itineraries with Cargo (RptVeh), Facility Cargo Arrivals (RptFacil), Movement Requirement Cargos (RptReq), and Cargo Predecessor/Successor Linkages (RptCargo). Many of the summary reports provide daily total profiles, including Vehicles in Use (RptVehDy), Required versus Delivered Cargo Totals (RptTotal by Major Unit, RptTotS by Requirement Class), Daily Facility Throughput Capacity (RptFCap), Daily Facility Vehicle Handling (RptFVeh), and Daily Measures of Effectiveness (RptMoe, RptMoeS). For example, Figure 4-48 lists the fields for the Required Versus Delivered Total Report Table (RptTotal).

Field Name	Units	Description
1 Theater		Theater
2 Major Unit		Major unit for this total delivery record
3 Cargo Measure		Cargo quantity measure (ston, pax, cbbl, mton, sq ft)
4 Delivery Day	day	Delivery day
5 Daily Quantity Required	Q	Incremental quantity required on this day
6 Daily Quantity Delivered	Q	Incremental quantity delivered on this day
7 Cumulative Required	Q	Cumulative quantity required by this day
8 Cumulative Delivered	Q	Cumulative quantity delivered by this day
9 Daily % Required	%	Incremental % of total major unit quantity required on this day
10 Daily % Delivered	%	Incremental % of total major unit quantity delivered on this day
11 Cumulative % Required	%	Cumulative % of total major unit quantity required by this day
12 Cumulative % Delivered	%	Cumulative % of total major unit quantity delivered by this day

Figure 4-48. Output Data Fields for the Required Versus Delivered Total Report Table (RptTotal).

4.7 Special Topics

Many special transportation issues and constraints can be addressed in GDAS using additional data tables which have not been addressed in the basic discussion above. These special topics and their related tables/fields can be reviewed in GDAS using the Inputs/Dictionary Topics menu. Such special topics include convoying, attrition, closure calculations, map graphics, special missions, and penalties/priorities. The related data elements for a topic may be stored across several different tables, depending on the database entities that are affected. For example, attrition rates for time-dependent exposure are defined on links in the NodeLink table, whereas probabilities for discrete attrition are defined at nodes in the Node table, and attrition adjustment factors are defined by vehicle type in the VehType table.

4.7.1 Convoying

In both the planning and scheduling phases, convoying is implemented as part of the underlying node/link routing procedures. When a cargo is considered for loading on a convoyable vehicle, the POE and POD is

known, and the vehicle makes the convoy decision based on the policy parameters in the Param table and the Convoy table. The convoy assembly and disassembly nodes must be be in different theaters in traveling from origin to destination. Other features that affect convoying include the ship speed (VehData table), the Max Speed Convoyed (Param table) and the Convoy Begin Day (Convoy table) and the Max Diversion Distance.

During simulation, the number of escorts available for each convoy route are tracked to determine the actual convoy departure times. Attrition calculations for convoys are handled using the normal method, taking into account the (possibly different) link attrition rates and node attrition probabilities specified for the convoy routes. Returning ships also use the convoy route and therefore incur convoy delays.

The convoys created in the model are output to the ConvTrip table which identifies each trip in the Trip table that participated in the convoy.

Table	Field	Key?	Domain or Lookup	Units	Description
CONVOY	Convoy Assembly Node	Yes	FACILITY		Assembly node for ships and escorts on this convoy route (normally in the origin theater)
CONVOY	Assembly Facility	Yes	FACILITY		Assembly facility for ships and escorts on this convoy route
CONVOY	Convoy Disassembly Node	Yes	FACILITY		Final disassembly node for ships and escorts on this convoy route (normally in the destination theater)
CONVOY	Disassembly Facility	Yes	FACILITY		Final disassembly facility for ships and escorts on this convoy route
CONVOY	Convoy Route Type		ROUTTYPE		Convoy route type which can accomodate all ships in the convoy
CONVOY	Convoy Speed		1,99	knot	Speed at which all convoy ships travel on this convoy route
CONVOY	Convoy Delay Hours		HoursDelay	hr	Additional convoy transit delay time in hours for management operations, diversions, assembly and disassembly operations, etc. after the convoy assembly day and before the convoy disassembly
CONVOY	Convoy Interval Days		DaysDelayToHr	day	Minimum time interval in days between scheduled convoy departures
CONVOY	Convoy Min Vehicles		0,999		Minimum number of ships permitted in a convoy trip
CONVOY	Convoy Max Vehicles		0,999		Maximum number of ships permitted in a convoy trip
CONVOY	Max Vehicle Wait Days		DaysDelayToHr	day	Maximum ship waiting time to assemble a minimum size convoy beyond which the ship sails independently
CONVOY	Link Attrit Multiplier %		%	%	Convoy link attrition multiplier for ships in this convoy
CONVOY	Node Attrit Multiplier %		%	%	Convoy node attrition multiplier for ships in this convoy
Param	Scenario Name	Yes	A8		Scenario short name and directory name
Param	Do Convoying?		Yesflag		Yes if convoying is to be performed using the CONVOY table, blank otherwise
Param	Do Convoy At Intervals?		Yesflag		Yes if convoys are to be scheduled at regular intervals independent of convoy size (convoys can then be scheduled more efficiently)
Param	Convoy Begin Day		DayToHr	day (hr)	Day that convoy operations begin
Param	Max Speed Convoyed		1,99	knot	Max speed limit above which ships are not convoyed and instead travel independently
Param	Max Convoy Diversion		Short>=0	nmi	Max diversion distance above which ships are not convoyed and instead travel independently

Figure 4-49. Input Data Tables and Fields Related to Convoying.

Table	Field	Domain or Lookup	Units	Description
CONVTRIP	Convoy Trip Number	Record# Vehicle		Convoy trip number
CONVTRIP	Convoy Assembly Node	CONVOY		Assembly node for this convoy trip
CONVTRIP	Assembly Facility	CONVOY		Assembly facility for this convoy trip
CONVTRIP	Convoy Disassembly Node	CONVOY		Final disassembly node for ships and escorts on this convoy trip
CONVTRIP	Disassembly Facility	CONVOY		Final disassembly facility for ships and escorts on this convoy trip
CONVTRIP	Convoy Assembly Day	DayToHr	day (hr)	Depart day of the convoy at the assembly point
CONVTRIP	Convoy Disassembly Day	DayToHr	day (hr)	Depart day of the ships in the convoy at the disassembly point
CONVTRIP	Convoy Size	1,99		Number of ships in the convoy
CONVTRIP	Number of Escorts	1,99		Number of escorts in the convoy
TRIP	Trip Number	Record# BigStop		Trip number
TRIP	Convoy Trip Number	CONVTRIP		Convoy trip number this voyage is assigned to, if any (if a trip has multiple convoys between different stops, only the last convoy trip is stored here)

Figure 4-50. Output Data Tables and Fields Related to Convoying.

4.7.2 Attrition

In GDAS, the travel routes and distances between ports for each ship and aircraft are expressed in terms of nodes and links on an intermodal transportation network. The general approach for attrition is to decompose the overall attrition effects into individual attrition submodels at each air and sea port and on each travel link between ports. By associating attrition rates with each port and link separately, the analyst has tremendous flexibility to define the geographic level of detail by adding links or changing individual link probabilities. In addition, the time variation capability of GDAS provides the capability to change any or all attrition rates over time. For modeling flexibility, the attrition factors for links represent exposure rates (i.e., slower travel times yield greater attrition), whereas the attrition factors for nodes represent discrete probabilities per visit. The attrition rates can be scaled by aircraft or ship type to represent different protection, detection, or vulnerability characteristics.

An example of the attrition probability calculations is provided below:

Formulas

link attrition probability =

1 - exp(- (link attrition rate/day) * (travel time in days))

node attrition probability =

(discrete node attrition probability applied when leaving the node)

Sample Data

cargo moves via "Airlift" on a single link from "Charleston" to "Jacksonville"

link data: link distance = 180 mi

link delay = 2 hr

travel speed = 450 mph

link attrit rate = 200 %%/day = .2/day ("%%" denotes a % of a % or .0001)

node data: discrete node attrition probability of 10% at "Charleston"

Sample Attrition Calculations

travel time

180 mi/450 mph + 2 hr = 2.4 hr = .1 day

link attrition probability =

= 1 - exp(-.2/day * .1 day)

= 1 - exp(-.02)

= .0198 (or ~ 2%)

node attrition probability = .1 (or 10%)

total probability of attrition

= 1 - (probability of not being attrited)

= 1 - (probability of no node attrition) * (probability of no link attrition)

= 1 - (1 - node attrit probability) * (1 - link attrit probability)

= 1 - (.9) * (.9802)

= .1178 (1178 %% is stored in the database, where "%%" is a % of a % or .0001)

During simulation, the future model will attrit vehicles using the input attrition data, removing attritted vehicles from the scheduling problem after completion of the voyage (i.e., after cargo has been off-loaded at the POD), and identifying the cargo loaded on the attrited vehicle. The attritted cargo is still recorded in the database with delivery and closure dates as if it had not been on the attrited vehicle. Queries and reports can be generated to display the attrited cargos for any given run.

An "expected value" form of the attrition calculation is available for analyzing the results of a single run. After completion of a simulation run, a "conditional expected value" calculation processes all cargo delivered during the simulation (including the cargo on attrited vehicles) using the attrition rates which were effective on the links at the time the cargo moved from POE to POD. This conditional expected value determines the probability of attrition for each cargo and calculates the expected amount of cargo that is delivered based on the node/link route and itinerary of each cargo.

Table	Field	Key?	Domain or Lookup	Units	Description
CONVOY	Convoy Assembly Node	Yes	FACILITY		Assembly node for ships and escorts on this convoy route (normally in the origin theater)
CONVOY	Assembly Facility	Yes	FACILITY		Assembly facility for ships and escorts on this convoy route
CONVOY	Convoy Disassembly Node	Yes	FACILITY		Final disassembly node for ships and escorts on this convoy route (normally in the destination theater)
CONVOY	Disassembly Facility	Yes	FACILITY		Final disassembly facility for ships and escorts on this convoy route
CONVOY	Link Attrit Multiplier %		%	%	Convoy link attrition multiplier for ships in this convoy
CONVOY	Node Attrit Multiplier %		%	%	Convoy node attrition multiplier for ships in this convoy
NODE	Node Name	Yes	A15		Node name corresponding to a port, transhipment point, origin, destination, routing point etc.
NODE	Attrit Probability %%		0,9999	%%	Discrete probability of attrition or breakdown when departing this node
NODELINK	From Node	Yes	NODE		From node name
NODELINK	To Node	Yes	NODE		To node name
NODELINK	Transport Mode	Yes	MODE		Transport mode for this link (only one link is permitted for each mode; multiple links can be created by adding nodes)
NODELINK	Attrit Daily Rate %%		0,9999	%%/day	Attrition or breakdown rate on this link for exposure-based attrition
Param	Scenario Name	Yes	A8		Scenario short name and directory name
Param	Do Attrition?		Yesflag		Yes if attrition or breakdown is to be performed, blank otherwise
Param	Random Number Seed		Short>=0		Random number seed for stochastic simulations including attrition
ReqType	Requirement Type	Yes	A15		Requirement type or unit type
ReqType	Regeneration Delay Days		DaysDelayToHr	day (hr)	Nonzero delay days to regenerate attritted cargo for this requirement; cargo is regenerated with the same data as the original movement (blank means no regeneration)
VEHTYPE	Vehicle Type	Yes	SHAPE		Vehicle type name, e.g. Breakbulk for sealift, C-17 for airlift, etc.
VEHTYPE	Link Attrit Multiplier %		%	%	Attrition adjustment multiplier applied to the link attrition or breakdown rate for this vehicle type while in transit (blank or 0 is treated as 100%)
VEHTYPE	Node Attrit Multiplier %		%	%	Attrition adjustment multiplier applied to the node attrition or breakdown rate for this vehicle type while at the node (blank or 0 is treated as 100%)

Figure 4-51. Input Data Tables and Fields Related to Attrition (%% denotes a % of a % or .0001).

Table	Field	Key?	Domain or Lookup	Units	Description
Cargo	Cargo Number	Yes	Record# BigStop		Cargo or shipment number
Cargo	Is Attritted?		Yesflag		Yes if the cargo is attritted in the last run results, blank otherwise
Cargo	Attrit Probability %%		0,9999	%%	Calculated cumulative probability of attrition (in %% or ten thousandths) for the cargo based on its route and schedule and including the probability of attrition of prior cargos
RPTREQ	Requirement Id	Yes	Require		Movement requirement or package id
RPTREQ	Basic Quantity Measure	Yes	MEASURE		Basic unit of measure for reporting (ston, pax, cbbl)
RPTREQ	Cargo Number	Yes	Cargo		Cargo or shipment number
RPTREQ	Is Attritted?		Yesflag		Yes if the cargo is attritted in the last run results, blank otherwise
RPTREQ	Attrit Probability %%		0,9999	%%	Calculated cumulative probability of attrition (in %% or ten thousandths) for the cargo based on its route and schedule and including the attrition of predecessor cargos
RPTREQ	Expected Quantity		reqqn		Expected delivery quantity for display, computed as the cargo quantity times the attrition probability
VEHICLE	Vehicle Number	Yes	Record# Vehicle		Vehicle unique sequential number
VEHICLE	Attrit or Damage Day		DayToHr	day (hr)	Last attrit or breakdown day for this vehicle, if any

Figure 4-52. Output Data Tables and Fields Related to Attrition (%% denotes a % of a % or .0001).

4.7.3 Closure Calculations

Database tables and fields related to closure calculations are listed in Figure 4-53. A unit is considered "closed" when the specified Closure Required Cargo % and the Closure Required Pax % arrive at the destination. If the required percentages are set to 100%, then all of the units requirements must be delivered to count as closed.

Table	Field	Key?	Domain or Lookup	InOut	Units	Description
CARGCLAS	Cargo Class	Yes	A15	Input		Cargo class (Dry, Pax, POL) which defines dimensional measures for cargo
CARGCLAS	Is Pax?		Yesflag	Input		Yes if the cargo class represents passengers, used to compute closure based on the MAJUNIT % closure criteria
MAJUNIT	Major Unit	Yes	A20	Input		Major unit name for analysis of requirement closures and measures of effectiveness
MAJUNIT	Computed Closure Day		DayToHr	Output	day (hr)	Closure day for the major unit based on both the Pax and cargo closure minimum % specified in the ReqType table
MAJUNIT	Closure Required Cargo %		%	Input	%	Minimum percent of the cargo which must be delivered in order to calculate unit closure (if the % is never attained, closure is based on the last portion delivered)
MAJUNIT	Closure Required PAX %		%	Input	%	Minimum percent of the passengers which must be delivered in order to calculate unit closure (if the % is never attained, closure is based on the last portion delivered)
ReqType	Requirement Type	Yes	A15	Input		Requirement type or unit type
ReqType	Assembly Delay Days		DaysDelayToHr	Input	day (hr)	Additional assembly delay days needed after delivery at the destination used to calculate closure and lateness relative to the RDD
Require	Requirement Id	Yes	A15	Output		Movement requirement or package id
Require	Computed Closure Day		DayToHr	Output	day (hr)	Closure day for the requirement based on the closure minimum % requirement specified in the ReqType table
RPTREQ	Requirement Id	Yes	Require	Output		Movement requirement or package id
RPTREQ	Basic Quantity Measure	Yes	MEASURE	Output		Basic unit of measure for reporting (ston, pax, cbbl)
RPTREQ	Cargo Number	Yes	Cargo	Output		Cargo or shipment number
RPTREQ	Computed Closure Day		DayToHr	Output	day	Closure day for the requirement based on the closure minimum % requirement specified in the ReqType table

Figure 4-53. Data Tables and Fields Related to Closure Calculations.

4.7.4 Map Graphics

Data tables and fields related to the world map graphics are listed in Figure 4-54. All aspects of the drawing display can be controlled, including layers, colors, shapes, and sizes. In general, these parameters can be left at their defaults unless a particular graphical effect is desired.

Table	Field	Is Key?	Domain or Lookup	Description
MapColor	1 Color	Yes	A15	Name of the color for mapping
MapColor	2 Red Intensity	No	Byte>=0	Red intensity for the color
MapColor	3 Green Intensity	No	Byte>=0	Green intensity for the color
MapColor	4 Blue Intensity	No	Byte>=0	Blue intensity for the color
MapFont	1 Font Name	Yes	A50	Windows Font (or MapInfo Helvitica, Courier, Times)
MapFStyl	1 Font Style	Yes	A25	Name of Font style
MapFStyl	2 Style Value	No	Short>=0	MapInfo value for this Font style
MapLayer	1 Layer ID	Yes	Table Any Case	The unique layer ID (generated as a table in the mapping application)
MapLayer	2 Layer Label	No	Menu Item	Layer description used in the mapping application menus
MapLayer	3 Map Table	No	MapTable	Lookup into the MapTable table for the original table
MapLayer	4 Layer Value	No	A255	The Layer Field value for this layer
MapLayer	5 Begin Off	No	Boolean	True if the layer display should be off initially
MapLayer	6 Symbol Type	No	MapSymbol	The mapping symbol shape or line type
MapLayer	7 Symbol Color	No	MapColor	The color of the symbol
MapLayer	8 Symbol Size	No	0,48	The point size of the node symbol or line width
MapLayer	9 Symbol Min Scale	No	Short>=0	The minimum scale (closest in) for which this layer is displayed, express as width of view in miles
MapLayer	10 Symbol Max Scale	No	Short>=0	The maximum scale (farthest out) for which this layer is displayed, expressed as width of view in miles
MapLayer	11 Label Font	No	MapFont	The font type for the layers labels
MapLayer	12 Label Style	No	MapFStyl	The font style for the layer labels
MapLayer	13 Label Color	No	MapColor	The font color for the layer labels
MapLayer	14 Label Size	No	Short>=0	The font point size for the layer labels
MapLayer	15 Label Min Scale	No	Short>=0	The minimum scale for which the label is displayed, expressed as width of image in miles
MapLayer	16 Label Max Scale	No	Short>=0	The maximun scale for which the label is displayed, expressed as width of image in miles
MapLine	1 Line	Yes	A25	A line type
MapLine	2 Line Value	No	Byte>=0	The MapInfo numeric value for this line type
MapNode	1 Node Name	Yes	Node	Node name or location extracted from NODE for the world map display
MapNode	2 Node Type	No	NodeType	Node type for world map graphics display
MapNode	3 Node Latitude	No	Lat	Node latitude (positive is North, negative is South)
MapNode	4 Node Longitude	No	Lon	Node longitude (positive is East, negative is West)
MapNode	5 Is Node Disabled?	No	Boolean	Checked or True if the node is disabled, otherwise False
MapShape	1 Shape	Yes	A25	A shape type
MapShape	2 Character Value	No	Byte>=0	The MapInfo numeric value for this symbol shape
MapShape	3 Font Name	No	MapFont	The font name of a symbol shape
MapShape	4 Font Style	No	MapFStyl	The font style for this symbol shape and character value
MapSymbol	1 Map Type	Yes	MapType	The type of mapping display appropriate for the symbol (Node or Link)
MapSymbol	2 Symbol	Yes	A25	A symbol available for the mapping levels, either a shape for nodes or a line type for links
MapType	1 Map Type	Yes	A10	Available mapping display types
Node	2 Node Type	No	NodeType	Node type for world map graphics display
Node	3 Node Latitude	No	Lat	Node latitude (positive is North, negative is South)
Node	4 Node Longitude	No	Lon	Node longitude (positive is East, negative is West)

NodeType	1 Node Type	Yes	A15	Node type for world map display
Param	3 Vehicle Snapshot Day	No	simendday	Current day used to interpolate vehicle locations for the world map display
Param	4 Vehicle Snapshot Hour	No	Hour	Current hour used to interpolate vehicle locations for the world map display
Vehicle	8 Computed Latitude	No	Lat	Current latitude computed for the current date and time (positive is North, negative is South)
Vehicle	9 Computed Longitude	No	Lon	Current longitude computed for the current date and time (positive is East, negative is West)

Figure 4-54. Data Tables and Fields Related to World Map Graphics.

4.7.5 Planning and Scheduling Penalties and Priorities

The mode planning process routes a movement requirement from an assigned starting node (either the initial origin, or an intermediate origin which represents the end node of a previously scheduled cargo) through the transportation network to its final destination, possibly through several modes of transportation. The planning process uses notional travel times and delays set in the Mode table, without treating individual vehicle assignments. The planning methodology uses a node-oriented shortest path type algorithm as a outer framework, but actually uses forward-reaching dynamic programming to evaluate alternate states at each node since multiple penalty criteria must be evaluated as well as linking dependencies to other scheduled cargo.

The planning process uses the same types of penalty factors for cargo delivery timeliness as scheduling, but relies on generic vehicle use penalties specified for each transportation mode in the Mode table. Once the preferred transportation network path has been identified by the dynamic programming algorithm, back-tracking is used from the destination RDD to set a Target Lift Date (TLD).

Scheduling evaluates each candidate lift vehicle with preliminary screening tests to ensure that the cargo and vehicle are compatible, the vehicle can visit the cargo ports, and that special mission considerations are compatible. If the vehicle passes the screening tests, then a more detailed route insertion algorithm is executed to select load and unload stops in the vehicle route and to estimate marginal insertion penalties for the entire vehicle itinerary. Finally, the vehicle with the least cost/benefit ratio is selected for assignment.

The scheduling then performs a different perspective in which it evaluates other promising cargo assignments for the same vehicle from the same POE port. The candidate cargos are evaluated using the same insertion algorithm and penalties as before, but only those cargo/vehicle assignments with marginal cost/benefit less than the value of the Cost/Benefit Threshold in the Reqtype table for that Requirement Type, are immediately assigned to the vehicle. This second evaluation allows a quicker load out of the vehicle and improves the overall efficiency of the scheduler.

Table	Field	Domain or Lookup	Description
Param	7 Do Static Resupply?	Boolean	True if static resupply requirement generation is to be performed (can be set False to re-use the dynamic resupply computed from a prior run)
Param	17 Personnel Lead Days	DaysDelayToHr	Earliest lead time that personnel can arrive prior to other cargo in the same requirement
PlanFlt	6 Planning Ton-Hour Penalty	1,999	Nominal penalty per ton per hr for transport via this vehicle type for planning routes and target lift dates
PlanFlt	12 Route Delay Penalty	Short>=0	Penalty for the delay of prescheduled stops when inserting new stops, the input value is the penalty of one day delay in cents, with increasing cost for greater delays
ReqType	4 Planning Horizon Days	DaysDelayToHr	Planning or look-ahead horizon in days for scheduling cargos of this requirement type prior to their target lift date
ReqType	8 RDD Tolerance	DaysDelayToHr	Days tolerance for lateness at the destination relative to the RDD before mode planning increases delivery cost to reduce lateness
ReqType	9 Max Days Late	DaysDelayToHr	Days late relative to the target delivery date beyond which a cargo is rejected in scheduling and is reported with rejection reasons, even if the penalty is acceptable
ReqType	10 Cargo Lateness Penalty	0,100	Penalty for cargo ton-days of lateness (as compared with vehicle usage penalties) in the scheduling algorithm
ReqType	11 Penalty/Benefit Cut-off	Long>=1	Cost cut off level above which a potential cargo assignment is rejected early in the multi-port scheduling algorithm (blank or a large value means no cutoff)
ReqType	12 Early Assignment Level	Short>=0	Threshold penalty/benefit level below which a potential cargo/ship assignment is accepted immediately in the multi-port scheduling algorithm (a large value reduces run time but may make a selection before costing a preferred vehicle)
ReqType	14 Default Priority Order	1,99	Default priority order for this requirement type if not specified for a given requirement (1 is the earliest priority order; blank is treated as no priority or as 99)
ReqType	16 Integrity Benefit	DaysDelayToHr	Wait days benefit indicating a preference for loading identical Requirement Id's onto the same vehicle trip
Require	7 EDD	DayToHr	Earliest allowed delivery day of the requirement at its destination prior to assembly
Require	9 Priority Order	1,99	Relative priority order for this requirement as a secondary sort after the Target Lift Date (one means first priority in assigning lift assets, blank defaults to the priority order of the requirement type)
StowPen	4 Stow Penalty	Short>=0	Stow penalty per unit basic quantity of cargo for loading into this vehicle compartment
SuppReq	8 Priority Order	1,99	Scheduling priority order when generation movement requirements for resupply
VehFleet	12 New Vehicle Penalty	Short>=0	Penalty for the first use of a new vehicle of this type and fleet
VehType	5 Time Penalty	0,999	Penalty for vehicle usage per hour, used to compare with cargo lateness in the scheduling algorithm
VehType	6 Greedy Vehicle Level	Short>=0	Limit on the acceptable cost/benefit ratio for a greedy vehicle trying to get additional cargo immediately after an assignment
VFacType	6 Facility Visit Penalty	Short>=0	Penalty for multi-facility visits on a single trip, used in the scheduling algorithm (the first POE and POD facilities on a new trip are not penalized)

Figure 4-55. Data Tables and Fields Related to Penalties and Priorities.

4.7.6 Special Missions

Special missions permit the explict assignment of certain vehicles or vehicle fleets to certain movement requirements for a specified period of time. Data tables and fields related to special missions are listed in Figure 4-56.

Table	Field	Is Key?	Domain or Lookup	Description
Mission	1 Special Mission	Yes	A15	Name of a special mission, e.g. Marine amphibious task force, or crane ship, or other mission
Mission	2 Mission Begin Day	No	DayToHr	Begin day that a designated special mission ship or fleet is restricted to matching special-mission requirements only
Mission	3 Mission End Day	No	DayToHr	End day that a designated special mission ship or fleet is restricted to matching special-mission requirements only
Mission	4 Delay Hours After Offload	No	HoursDelay	Additional delay hours in the depart time after offload of special mission cargo at its ultimate destination node (delays the vehicle at the stop, not the cargo delivery)
ReqMiss	1 Requirement Id	Yes	Require	Movement requirement having a special mission
ReqMiss	2 Cargo Class	Yes	CargClas	Cargo class to which the special mission applies (Dry, Pax, etc.)
ReqMiss	3 Mode	Yes	Mode	Transport mode to which the special mission applies
ReqMiss	4 Special Mission	No	Mission	Special mission for this requirement, cargo class, and transport mode
VehFleet	1 Vehicle Type	Yes	VehData	Vehicle type
VehFleet	2 Vehicle Identifier	Yes	VehData	Vehicle identifier, such as ship name or aircraft squadron, for this starting location, vehicle type, and fleet
VehFleet	3 Vehicle Fleet	Yes	FleetVehTypeFleet	Fleet identifier for this starting location
VehFleet	11 Special Mission	No	Mission	Special mission which restricts this fleet to matching special mission movement requirements for a designated period of time

Figure 4-56. Data Tables and Fields Related to Special Missions.

4.7.7 Prescheduled Stops

As discussed previously, each Planning Fleet can be assigned a prescheduled stop itinerary, including cyclical liner routes that are automatically duplicated and expanded into multiple trips. This automatic replication saves considerable data entry for multiple cycles and vehicles. Any prescheduled stops that are defined for the Planning Fleet, as listed in the StdStop table for that fleet, are generated and expanded prior at the beginning of the model run and are retained in the final schedule. For example, the DOD Voluntary Intermodal Sealift Agreement (VISA) program makes uses of commercial liner routes which have preset, cyclical itineraries. Each prescheduled itinerary is listed as a separate Planning Fleet and assigned cyclical stops in the StdStop table.

All of the ships in a given Planning Fleet are assigned to the same prescheduled stops in StdStop, if they exist. However, the individual ships on a route are typically given different Start Route Offset as specified in VehFleet. For example, in a liner operation one ship may arrive and depart each week, so the Standard Depart Interval is one week and the individual ship Start Route Offsets differ by a week. If the prescheduled stops are cyclical (they start and stop at the same node), then the prescheduled itineraries are automatically repeated over time until the end of the simulation, or until the Start Route Last Day specified in VehFleet. The data tables and fields related to prescheduled stops are shown in Figure 4-57.

Table	#	Field Name	Is Key?	Domain	Units	Description
PlanFlt	1	Planning Fleet	Yes	A15		Aggregation of fleets used for planning modes, ports, cargo configurations, and prescheduled routes
PlanFlt	10	Standard Depart Interval	No	Short>=1	day	Standard depart time interval for a prescheduled route, stored for reference only and not used to generate routes
PlanFlt	11	Stop Arrival Tolerance	No	DaysDelayToHr	day (hr)	Time window tolerance for early or late arrival at the prescheduled stops on this route
PlanFlt	12	Route Delay Penalty	No	Short>=0		Penalty for the delay of prescheduled stops when inserting new stops, the input value is the penalty of one day delay in cents, with increasing cost for greater delays
PlanFlt	13	Remain On Route?	No	Boolean	T/F	Checked or True if the prescheduled ship should stay on its prescheduled route only up through the Route Last Day, otherwise False
PlanFlt	14	Description	No	A50		Description of the prescheduled route
StdStop	1	Planning Fleet	Yes	PlanFlt		Planning fleet that has prescheduled stops
StdStop	2	Stop Sequence	Yes	Short>=1		Stop sequence number for this prescheduled planning fleet (stops are assumed to repeat cyclically if the first and last stop have the same node and facility)
StdStop	3	Arrive Day	No	DayToHr	day (hr)	Arrive day offset for this prescheduled stop sequence, starting from zero (the actual stop time is depends on the offset in VEHFLEET and the number of iterations
StdStop	4	Node	No	Facility		Node associated with this prescheduled stop sequence number
StdStop	5	Facility	No	Facility		Facility associated with this prescheduled stop sequence number
StdStop	6	Depart Day	No	DayToHr	day (hr)	Depart day offset for this prescheduled stop sequence, starting from zero
VehFleet	1	Vehicle Type	Yes	VehData		Vehicle type
VehFleet	2	Vehicle Identifier	Yes	VehData		Vehicle identifier, such as ship name or aircraft squadron, for this starting location, vehicle type, and fleet
VehFleet	3	Vehicle Fleet	Yes	FleetVehType		Fleet identifier for this starting location
VehFleet	9	Start Route Offset	No	-99,999	day	Offset day for this fleet and vehicle for a standard prescheduled starting route cycle
VehFleet	10	Start Route Last Day	No	DayToHr	day (hr)	Last day beyond which the prescheduled starting route is no longer cycled

Figure 4-57. Data Tables and Fields Related to Prescheduled Stops.

An example is helpful to understand the relationships. Suppose a commercial sealift carrier has a liner route called TransPacific using ships named Zeltec, Gateway, Brave Bull, Hornsby, and Adams. The prescheduled stop sequence for the TransPacific route is entered in the StdStop table as shown in Figure 4-58. Note that it is a cyclical route (starts and ends at Seattle), with relative Arrive Day and Depart Day starting at day 0.

Planning Fleet	Stop Sequence	Arrive Day	Node	Facility	Depart Day
TransPacific	1	0	Seattle	Container	2
TransPacific	2	4	Oakland	Container	6
TransPacific	3	10	Honolulu	Container	11
TransPacific	4	19	Guam	Container	20
TransPacific	5	23	Kaohsiung	Container	25
TransPacific	6	35	Seattle	Container	37

Figure 4-58. Prescheduled Liner Route Example

For this route, the ships are assigned to start weekly, 7 days apart. This is specified by setting the Start Route Offset to be 7 days apart for each ship in the VehFleet table. The offset is relative to the 0 Arrive Day for the first stop in Seattle indicated in the standard route in StdStop. If the Start Route Offset numbers are set to values greater than 0, then it would take 28 simulation days before the last vehicle entered the simulation. By assigning negative offsets, each 7 days less than the predecessor ship, the ships can all be underway at various ports in the route when the simulation starts on day 1, as follows:

Vehicle Identifier	Start Route Offset
Zeltec	1
Gateway	-6
Brave Bull	-13
Hornsby	-20
Adams	-27

Figure 4-59. Negative Starting Route Offset for Ships Arriving Every 7 Days.

In this way, all vehicles are in route no later than day 8. Note it is a good idea to wait until all vehicles have made their first stop at a Node before scheduling any cargo to be picked up by them. In addition, the model does not simulate day 0, so the next port have day 0 is the first stop in the simulation.

4.7.8 Static and Dynamic Resupply Generation

GDAS can now generate resupply requirements and schedule them in the global transportation network, based on when units arrive and how much they consume resupply from inventory. The new resupply features are invoked by entering data into several new tables, namely SuppCons (Supply Consumption Rate), SupStore (Supply Storage Inventory), SuppReq (Suppy Requirement), and SupQuan (Supply Quantity Density). When you leave these tables empty, GDAS operates as before without any automatic resupply generation. When resupply is generated, GDAS reports the results of dynamic resupply activities in a new report table named RptSupSt (Report Supply Storage). Additional outputs include dynamically generated resupply orders in the Require and ReqQuan tables, as well as scheduled resupply cargos in the Cargo table. Tables and data related to dynamic and static resupply generation are listed in Figure 4-60 and discussed in the paragraphs following.

Table	#	Field Name	Is Key?	Domain	Units	Description
Param	1	Scenario Name	Yes	A8		Scenario short name and directory name
Param	6	Do Dynamic	No	Boolean	T/F	Checked or True if dynamic resupply generation is to
Param	7	Do Static Resupply?	No	Boolean		True if static resupply requirement generation is to be
Param	8	Static Order Interval	No	1,99	day (hr)	Aggregation interval for computing resupply order
ReqType	1	Requirement Type	Yes	A15		Requirement type or unit type
ReqType	17	Is Resupply?	No	Boolean		True or checked if this requirement type is
Require	1	Requirement Id	Yes	A15		Movement requirement or package id
Require	10	Supply Requirement	No	SuppReq		Supply requirement identifier in the SUPPREQ table,
SuppCons	1	Consuming Req	Yes	ReqType		Requirement type that consumes resupply in the
SuppCons	2	Consumption	Yes	Theater		Destination theater in which consumption occurs
SuppCons	3	Consuming Cargo	Yes	CargoCat		Consuming cargo category for estimating consumption
SuppCons	4	Cargo Category	Yes	CargoCat		Supply cargo category that is stored at an inventory
SuppCons	5	Supply	No	0,999	Q/(1000	Daily consumption rate expressed as supply basic
SuppCons	6	Accompany Days of	No	Byte>=0	Q/(1000	Accompanying supply quantity in days of supply for
SuppReq	1	Supply Requirement	Yes	A15		Supply requirement identifier for static and dynamic
SuppReq	2	Supply Source Node	No	Node		Resupply origin node
SuppReq	3	Supply Category	No	SupStore		Resupply cargo category
SuppReq	4	Supply Storage	No	SupStore		Resupply storage node or terminal storage location
SuppReq	5	Supply Major Unit	No	MajUnit		Resupply major unit, which has a requirement type
SuppReq	6	Supply Availability	No	DayToHr	day (hr)	Earliest time that resupply can be orderd from this
SuppReq	7	Supply Delivery	No	DayToHr	day (hr)	Notional resupply delivery time or lead time, usually
SuppReq	8	Priority Order	No	1,99		Scheduling priority order when generation movement
SupQuan	1	Supply Requirement	Yes	SuppReq		Supply requirement identifier matching a record in
SupQuan	2	Unit of Measure	Yes	MeasCargQuan		Unit of measure for the resupply category
SupQuan	3	Quantity	No	Long>=0	Q	Relative quantity of resupply in the unit of measure,
SupStore	1	Supply Cargo	Yes	CargoCat		Supply cargo category that is stored at an inventory
SupStore	2	Supply Storage	Yes	Node		Resupply storage node or terminal storage location
SupStore	3	Prepositioned Stock	No	reqqn	Q	Quantity of reserved stock prepositioned at this supply
SupStore	4	Stock Safety Level	No	reqqn	Q	Minimum safe stockpile level, which is used to
SupStore	5	Stock Order To	No	reqqn	Q	Target stockpile level to reorder to when orders are
SupStore	6	Min Order Quantity	No	Long>=1	Q	Minimum order quantity for this supply category in

Figure 4-60. Tables and Fields Related to Resupply Generation.

SuppCons. This table contains the resupply consumption rates. The key fields represent the consumption rate as a function of : the consuming Requirement Type, the Consuming Cargo Category, the Consumption Theater, and the Consumed Cargo Category. Note that any kind of Cargo Category can consume multiple kinds of any other Cargo Category. The consumption rate is measured in basic quantity consumed, per 1000 consuming basic quantity units, per day. For example, if a 5 ton vehicle, measured in basic quantity units of Stons, consumes 1 barrel of POL per day, then the arrival of a cargo containing 1000 Stons of vehicles will begin to consume 200 barrels of POL per day. If you set GDAS to measure POL in basic units of hundreds of barrels per day (CBBL) then you would enter 2 as the consumption rate in the SuppCons table. The Accompany Days of Supply field tells GDAS to add extra resupply to the theater inventory when the consuming requirements arrive at their destinations. When this value is large, you will see the inventory increase on the same day that cargos arrive, at the same time they begin to consume resupply.

SupStore. Each record in the SupStore table describes a storage terminal or inventory location for a consumable cargo category. The Prepositioned Stock represents the amount of cargo at the storage node on the day the scenario begins. The inventory policy for the Supply Storage Node storing a Supply Cargo Category is controlled by the values for Stock Safety Level, Stock Order to Level, and Minimum Order Quantity. When GDAS forecasts that the inventory will go below the safety level within the currently estimated lead-time for shipment, based on the current in-theater consumption rate, GDAS orders enough cargo to bring the inventory up to the Order to Level. GDAS will not order any less than the Minimum Order Quantity. The size of the Order will also be a multiple of the new Discrete Load Increment specified in the CargoCat table.

SuppReq/SupQuan. These tables are analogous to the Require and ReqQuan tables, except that the are "templates" for ordering new resupply requirements. For each resupply cargo category, these tables tell GDAS where the cargo will come from, where it will go to, when it can be available, and an initial estimate of the order lead time used for initial static resupply calculations (the lead time is re-calculated dynamically in GDAS). SupQuan defines relative quantities in appropriate units of measure; the absolute quantities are not important, only the ratios. GDAS derives density ratios from these quantities when generating resupply orders.

ReqType. A new field called "Is Resupply?" has been added to this table. GDAS-generated resupply cargo must have an administrative Requirement Type that is distinct from non-resupply cargo. Such requirements will be overwritten on each simulation run, as GDAS recreates new orders and shipments to sustain inventory in the theater.

Some Cargo Categories can serve as both unit cargo and resupply. For example, roadable vehicles may be included in unit movements, but they can also be re-ordered in the form of resupply or replacements based on unit consumption rates. GDAS uses the Cargo Category to evaluate physical characteristics of the cargo (e.g., in CatMode); it uses the ReqType of the movement to define administrative handling characteristics. This is why the Is Resupply? Field is in the ReqType table. You must set "Is Resupply?" to "Yes" for resupply requirement types that GDAS will generate. Since a resupply requirement type depends on the Major Unit., you need to make sure that all consumed SuppReq records are associated with Major Units that have Requirement Types with the "Is Resupply?" flag set. In addition, you should not specify your own input movement requirements using these same Major Units, since GDAS will overwrite these.

Param. This Param table has three new fields. The "Do Static Resupply?", if set to Yes, tells GDAS to create static Require and ReqQuan resupply records from the SuppReq and SupQuan tables based on the original unit RDD's. GDAS examines the input movements in Require and ReqQuan, along with the consumption rates in SuppCons, to compute initial static resupply movements over the simulation time horizon. These static requirements are used for initial planning, prior to dynamic ordering and inventory in the theater. The "Static Order Interval" represents an interval of days and tells GDAS how to aggregate resupply quantities for the static calculation.

The "Do Dynamic Resupply?" field, if set to Yes, tells GDAS to create resupply cargos dynamically as needed, based on the consumption rates when the consuming cargos actually arrive.

If "Do Static Resupply?" is blank, GDAS will create resupply cargos from any resupply requirements that are already generated. This feature can be used to feed the dynamic requirements from one run into GDAS as static calculations for the next run. If the "Do Dynamic Resupply?" field is blank, then no dynamic orders are generated as units arrive, and no inventory tracking is performed in the simulation. Instead, the static resupply calculations can be used. And if both fields are blank, then neither static nor dynamic resupply is generated by GDAS just as before, and the SuppReq and SupStore tables are ignored.

RptSupSt. This new output table contains the inventory history for each SupStore inventory location, for each day of the plan. From RptSupSt you can generate charts showing inventory on hand, quantity on order, and cumulative demand rate for each inventory location and cargo category in SupStore, for each day of the plan. SupStore also reports the estimated lead time and the order number if a reorder occurs. The estimated lead-time is the lead-time GDAS uses to dynamically order and schedule a resupply requirement. The order number links the changes in inventory to specific resupply cargos that are generated in the Cargo table. These resupply cargos are matched to generated order records in the Require table, so that all lateness calculations and delivery profiles remain accurate. The dynamic resupply movements do affect both lateness and the delivery profiles.

Appendix A
Summary of Tables

Database Type Reference

Table	Label	Table Edit Type	Description
LateClassExtra	Extra Lateness Classifications	Constant Hide	Stores the standard lateness classifications that are always appended to the RptLate lateness summary report
MapColor	Mapping Colors	Edit	Lists the available colors for mapping objects (shapes and lines)
MapFile	Map File Paths	Edit	Lists the world map file paths
MapFont	Mapping Fonts	Edit	Lists the available fonts for mapping labels
MapFStyl	Mapping Font Styles	Edit	Lists the font styles for mapping labels
MapLine	Mapping Line Types	Constant NoEdit	Lists the available line symbols for map links
MapShape	Mapping Shape Types	Edit	Lists the available shape symbols for map nodes using installed Windows fonts
MapSymbol	Map Layer Display Symbols	Derive	Lists the shape and line symbols by mapping type available for the MapLayer symbols.
MapType	Mapping Table Types	Constant NoEdit	Lists the fundamental mapping table types (Node or Link)
MeasClas	Measure Class	Constant NoEdit	Defines the measurement classes (e.g. Cargo Quantity, Max Cargo Item Dimension, Vehicles Per Day, MOG or # Berths, Vehicle Dimension,
RejType	Rejection Type	Constant NoEdit	Lists the available delay reason types
SchedTyp	Scheduling Type	Constant NoEdit	Lists the scheduling model algorithm types
VaryDist	Vary Distribution	Constant NoEdit	Stochastic or parametric distribution types for sampling data
VaryParD	Vary Parametric Data	Display Only	Lists allowable tables and data fields for users to vary either parametrically or as time variations
VarySavD	Vary Storable Data	Future	Lists the allowable tables and fields which can be saved over multiple parametric or stochastic runs

Database Type Scenario

Table	Label	Table Edit Type	Description
BasMeas	Basic Measure	Edit	Lists basic measures for reporting primary cargo quantities (Ston, Cbbl, Pax); each cargo class has a basic measure used for quantity splits
CargClas	Cargo Class	Edit	Lists the major cargo classes (e.g., Dry, PAX, POL) that define which dimensional measures are applicable to each cargo category and cargo
CargConf	Cargo Configuration	Edit	Lists the cargo configurations used to containerize, package, or modify cargo for transport, and sets the time rate for configuration
CargoCat	Cargo Category	Edit	Lists the cargo categories which specifies the kind of cargo at the most detailed level, often based on JOPES three-position cargo category plus
CargType	Cargo Type	Edit	Lists the cargo types, which define kinds of cargo affecting stow factors, load rates, and load compatibility for a specific mode of
CatGroup	Category Group for Charts	Edit	Defines groupings of cargo categories which can be used to selectively display total quantities in delivery profile charts
CatMeas	Category Measure	Derive	Lists the dimensional measures applicable to each cargo category; generated automatically from the CLASMEAS table to provide a
CatMode	Cargo Category Mode	Keys Full	Lists the conversion of cargo categories to mode-specific cargo types which define stow factors and load rates for each vehicle type
ClasMeas	Cargo Class Measure	Edit	Lists the major classes of cargo and what quantity measures are applicable
Convoy	Convoy	Edit	Specifies information about convoy routes which are to be used for sealift when traveling between the assembly node theater and the
CptMeas	Compartment Measure	Edit	Lists the measures for defining compartment capacity
CptType	Compartment Type	Edit	Defines vehicle compartment types
Exclude	Exclusion	Edit	Sets user-definable exclusions for cargo loading, based on various combinations of factors such as Mode, Vehicle Type, Cargo Category,
FacCap	Facility Capacity	Edit	Specifies facility limits and constraints on cargo throughput for different facility measures
Facility	Facility	Edit	Lists port facilities at nodes
FacType	Facility Type	Edit	Lists the available facility or berth types which are used to define load rates at port facilities
Fleet	Administrative Fleet	Edit	Identifies groups of vehicles with common administrative characteristics for vehicle availability.

LateClass	Late Days Groups	Edit	Defines groups by days late for the RptLate lateness summary report
LinkCap	Node Link Capacity	Edit	Defines the capacity for constrained links and units of measure
LoadRate	Load Rate	Keys Computed	Specifies transfer rates for loading and unloading
MajUnit	Major Unit	Edit	Lists each major unit, which in GDAS is a grouping of requirements, either unit or non-unit, used to display delivery profiles and compute
MapLayer	Mapping Layer Specs	Update	Sets mapping layer characteristics such as color and symbol which can be edited by the user
MapTable	Mapping Table Specs	Hide	Defines the map table specifications
Measure	Measure	Edit	Lists the types of dimensional measures used to define cargo, vehicle compartments, or node facilities
Mission	Mission	Edit	Lists special missions such as TACS, AFOE, etc.
Mode	Mode of Transport	Edit	Lists transportation modes (air, sea, motor, organic, rail, intratheater air, etc.)
Node	Node	Edit	Lists nodes and locations for all ports, origins, destinations, transhipment points, and routing points
NodeCap	Node Capacity	Edit	Defines total throughput at each node for all facilities at the node
NodeLink	Node Link	Edit	Lists single leg links between nodes for transportation
NodeType	Node Type for Mapping	Edit	Lists the node types for world map display
Param	Parameter	Modify	Sets parameters for the scheduling model
PlanFlt	Planning Fleet	Edit	Lists the fleet aggregations used for planning modes, ports, cargo configurations, and pre-scheduled routes
PlnFltTr	Plan Fleet Transfer	Keys Full	Specifies the allowable fleet to fleet transfers
ReqClass	Requirement Class	Edit	Lists the aggregated requirement classes for calculating summary cargo delivery versus required totals for reports
ReqFleet	Required Fleet	Edit	Defines the allowable fleets by mode for a requirement type, if the requirement type is restricted to certain fleets
ReqImprv	Dynamic FacCap Change	Edit	Defines how the delivery of a requirement improves facility throughput

ReqLag	Requirement Link Lag	Edit	Defines timing links between delivery of independent and dependent requirements
ReqMiss	Required Mission	Edit	Lists special missions for requirements, cargo classes, and modes
ReqMode	Excluded Mode by Req	Edit	Lists excluded modes for specific requirements and cargo classes
ReqNImpr	Dynamic NodeCap Change	Edit	Defines how the delivery of a requirement improves node throughput
ReqNode	Required Node	Edit	Lists required intermediate POE or POD nodes or ports for movement requirements with specified staging, POE/POD time frames, and mode
ReqQuan	Requirement Quantity	Edit	Provides quantity data for each movement requirement and cargo category
ReqRet	Requirement Return	Future	Lists requirement return or transfer days, if any, for removing requirements from a theater and eliminating its supply consumption and
ReqType	Requirement Type	Edit	Provides data about requirement types or unit types
Require	Requirement to Move	Edit	Provides information about each movement requirement or package
RoutExcl	Route Exclusion	Edit	Lists excluded facility types for refueling on the various route types
RoutType	Route Type	Edit	Provides route type data for determining vehicle paths, including refueling range, refueling facility requirements, and payload versus
Service	Service	Edit	Lists the U.S. military services
Stage	Stage Location	Future	Lists the staging deployments which have predecessor and successor requirements
StdStop	Standard Stop	Edit	Defines the stop sequence for standard prescheduled routes used in vehicle intialization; the stops repeat cyclically if the first node and
StowFact	Stow Factor	Keys Computed	Specifies the stow factor for each combination of compartment type and cargo type
StowPen	Stow Penalty	Keys Computed	Lists combinations of compartment types and cargo types along with stow penalties
SuppCons	Supply Consumption	Future	Specifies standard daily consumption rates of resupply for consuming requirements
SuppReq	Supply Requirements	Edit	Lists the information needed to generate static and dynamic resupply requirements
SupQuan	Supply Quantities	Keys Computed	Lists the units of measure and relative quantities as density information for generating resupply movements

SupStore	Supply Destination	Edit	Provides data about resupply storage terminals in the theater
Theater	Theater	Edit	Provides data about the theaters
ThtrReq	Theater Require Type	Keys Full	Provides data about passenger weights by theater and requirement type
TimeVary	Time Variation	Edit	Specifies data which changes over time (derived from user inputs in the associated data tables, should not be edited directly)
VaryPar	Vary Parameter	Future	Specifies data elements to be varied parametrically
VarySave	Vary Save Data	Future	Defines data to be saved across multiple runs when data elements have parameter variations or sampling distributions
VaryStat	Vary Sampled Data	Future	Lists tables and data elements which are sampled from a stochastic distribution taking as mean the database value
VCptType	Veh Cpt Type	Edit	Lists the compartments available for each vehicle type
VehCap	Vehicle Capacity	Keys Computed	Defines load capacities for each vehicle identifier, compartment, and unit of measure
VehData	Vehicle Data	Edit	Provides detailed characteristics about each kind of vehicle identified in the system
VehFleet	Vehicle Availability Fleet	Edit	Lists the availability of vehicles by starting location or route, starting time for scheduling, and number of vehicles
VehType	Vehicle Type	Edit	Lists vehicle types by transport mode
VFacDim	Vehicle Dimension Limit	Edit	Sets cargo dimension limits for loading onto vehicle types at facility types
VFacType	Vehicle Facility Type	Keys Computed	Lists matchings of vehicle types and facility types for loading/unloading cargo

Database Type Tpfdd

Table	Label	Table Edit Type	Description
ACrgType	JOPES Air Cargo Type	Edit	Lists the JOPES air cargo types (Bulk, Oversize, etc.) and their maximum dimensions
AggCat	Aggr Cargo Category	Edit	Provides translations for aggregating cargo category
AggMajun	Aggr Major Unit	Edit	Provides translations for aggregating major unit
AggMode	Aggr Required Mode	Edit	Provides translations for aggregating required transport mode
AggNode	Aggr Node	Edit	Provides translations for aggregating node location
CCC	JOPES Cargo Cat Code	Edit	Lists the three character JOPES cargo category codes
CCC1	JOPES Cargo Cat Pos1	Edit	Lists the first position of the JOPES cargo category code, which defines the kind of cargo
CCC2	JOPES Cargo Cat Pos2	Edit	Lists the second position of the JOPES cargo category code, which defines the airlift cargo type and the unit class (Unit Equip, Acc Supply,
CCC3	JOPES Cargo Cat Pos3	Edit	Lists the third position of the JOPES cargo category code, which defines containerizability
CCC4	Custom Cargo Cat 4	Edit	Lists a customizable fourth position cargo category code, which specifies user-definable cargo item dimensions
ClassifC	JOPES Classif Code	Edit	Lists the JOPES security classification codes
CntrType	Container Type	Edit	Lists the containerizability types corresponding to the third position of the JOPES Cargo Category Code
CntrySt	JOPES Country State	Edit	Lists the JOPES country state codes and names
CrgDtLvl	JOPES Crg Detail Lev	Edit	Lists the JOPES TUCHA and TPFDD cargo detail levels
DelReas	NonUnit Delay Reason	Edit	Lists the JOPES codes for non-unit intermediate stop delay reasons
DelType	Unit Delay Type	Edit	Lists the JOPES codes for unit intermediate stop delay type, either total force or force increments
DeployIc	JOPES Deploy Indic	Edit	Lists the JOPES deployment indicator codes which characterize deployability

DischCfg	JOPES Discharge Code	Edit	Lists the JOPES discharge constraint codes
FIC	JOPES Force Indicate	Edit	Lists the JOPES force indicator codes
FuelType	Fuel Type Code	Edit	Lists the JOPES fuel types
GeoDate	Geoloc Date	Edit	Stores the geoloc file date
Geoloc	Geolocation	Edit	Stores the imported geoloc data from the JOPES Geofile
HeavLift	JOPES Heavy Lift	Edit	Lists the JOPES heavy lift codes
Import	Import Specification	Edit	Provides table, record, and field specifications for importing data from external databases
InstType	Installation Type	Edit	Lists the JOPES Geolocation installation type codes
LoadCfg	JOPES Load Config	Edit	Lists the JOPES load configuration codes
LogCode	JOPES Logistics Code	Edit	Lists the JOPES Geolocation logistics planning codes
MajCat	Major Cargo Category	Edit	Lists the major cargo categories corresponding to the first position of the JOPES cargo category code
Mode_Src	JOPES Mode & Source	Edit	Lists the JOPES transport mode and source code combinations
ModeCode	JOPES Move Type Code	Edit	Lists the JOPES transport mode codes
NUMoveTp	JOPES Non Unit Type	Edit	Lists the JOPES non-unit type movement codes
NURecTyp	Non Unit Record Type	Edit	Lists the JOPES TPFDD non-unit record types for Pax and Cargo
OrgCode	JOPES Organization	Edit	Lists the JOPES organization and service codes
PIC	JOPES Parent Indicat	Edit	Lists the JOPES parent indicator codes which describe subordinate splitting
PoiLoc	JOPES POI Location	Edit	Lists the JOPES intermediate port location codes
RecCode	JOPES Record Indicat	Edit	Lists the JOPES record indicator codes

StopCode	JOPES Stop Code	Edit	Lists the JOPES stop reason codes
SupClas1	JOPES Supply Class 1	Edit	Lists the JOPES major supply class code in position 1
SupClass	JOPES Supply Class	Edit	Lists the JOPES two-character supply class and subclass codes
TpId	TPFDD Ident	Edit	Stores the imported TPFDD Identifier record
TpNonUnt	TPFDD Non Unit	Edit	Stores the imported TPFDD Non Unit cargo and pax records
TpSrfCat	TPFDD SRF Category	Edit	Stores the imported TPFDD SRF category records for non-standard units
TpSrfDet	TPFDD SRF Detail	Edit	Stores the imported TPFDD SRF detail records for non-standard units
TpSrfId	TPFDD SRF Ident	Edit	Stores the imported TPFDD SRF identifier records for non-standard units
TpUnit	TPFDD Unit	Edit	Stores the imported TPFDD standard force unit records
TranpSrc	JOPES Trnsprt Source	Edit	Lists the JOPES transport source providing organization codes (MSC, MTMC, etc.)
Translat	Translation Table	Edit	Defines translations based on direct conversions, translation tables, or function mappings for importing data from external databases
TuCat	TUCHA F2 Category	Edit	Stores the imported TUCHA F2 cargo category quantities for standard unit types
TuDate	TUCHA Date	Edit	Stores the imported TUCHA date
TuDet	TUCHA F3 Detail	Edit	Stores the imported TUCHA F3 detail cargo quantities and dimensions for standard unit types
TuOldUtc	TUCHA AB Total	Edit	Stores the imported TUCHA AB records containing updated UTC status, often cancelled
TuUtc	TUCHA UTCs and Air	Edit	Stores the imported TUCHA ABF1 UTC records, including total air cargo type quantities
ULC	UNIT Level Code	Edit	Lists the JOPES unit level codes
UnitClas	JOPES Unit Class	Edit	Lists the JOPES unit classifications (Unit Equip, Acc Supply, Organic)
UnitStat	JOPES Unit Status	Edit	Lists the JOPES unit status codes (active, canceled)

UtcFunct	JOPES UTC Function	Edit	Lists the JOPES Unit Type Code functional area which is the first position of the Unit Type Code
UtcSubst	UTC Substitution	Edit	Lists the Unit Type Code substitutions for standard units that have no match in the TUCHA data

Appendix B

Data Dictionary

The Data Dictionary provides a complete definition of the tables, fields, key fields, domains, lookups, units of measures, and descriptions in the GDAS system. The online Help/Data menu provides immediate access to the Data Dictionary while you are editing tables. One of the most valuable uses of the Data Dictionary is to understand the relationships between tables so that you can work in a consistent, top-down fashion in defining new records in GDAS (e.g., for adding a new Transport Mode).

The complete Data Dictionary is provided in the pages following. An extract for the VehFleet table is shown in the figure. The first boxed lists the 8 character table name VehFleet, its long table name Vehicle Fleet, and a description of the table. Below the table information is a list of fields belonging to the table along with field definitions. In the field list, the first column repeats the table name, VehFleet. The second column lists the field number and field name, e.g. the first field is Vehicle Type.

VEHFLEET	Vehicle Fleet	Lists the availability of vehicles by starting location, starting time, and number of vehicles

Table		Field Name	Domain/ Lookup	Key?	In/Out	Unit Meas	Description
VEHFLEET	1	Vehicle Type	VEHDATA	Y	In		Vehicle type
VEHFLEET	2	Vehicle Identifier	VEHDATA	Y	In		Vehicle identifier for this start location
VEHFLEET	3	Vehicle Fleet	A15	Y	In		Fleet identifier for this start location
VEHFLEET	4	Number of Vehicles	Short>=0		In		Number of vehicles in the fleet for this vehicle type
VEHFLEET	5	Start Node	FACILITY		In		Home base node for this fleet and vehicle type (a vehicle returns to its home base if not otherwise assigned)
VEHFLEET	6	Start Facility	FACILITY		In		Home base facility for this fleet and vehicle type (a vehicle returns to its home base if not otherwise assigned)
VEHFLEET	7	Start Day Available	DayToHr		In	day (hr)	Day that this fleet and vehicle type are first available
VEHFLEET	8	Last Day Returned	DayToHr		In	day (hr)	Day that this fleet and vehicle type are returned to base with no more use (blank or 0 is treated as available to the end)
VEHFLEET	9	Special Mission	MISSION		In		Special mission which restricts this fleet to matching special mission movement requirements for a designated time period
VEHFLEET	10	New Vehicle Penalty	Short>=0		In	$/new veh	Penalty for the first use of a new vehicle of this type and fleet
VEHFLEET	11	Call Sign	A4		In		International call sign of the vehicle or ship or fleet
VEHFLEET	12	NISC Number	A5		In		Naval Intelligence Security Code number of the vehicle or ship fleet

Figure B-1. Data Dictionary Extract for the VehFleet Table

The third column is labeled as Domain/Lookup, meaning that it displays either a domain or a lookup table. If an upper-case lookup table name is shown, then the field has a lookup, and the domain is inherited from the parent table. For example, the first two fields have a joint lookup into VehData, which means that all Vehicle Type and Vehicle Identifier combinations in the VehFleet must match the parent values in the VehData lookup table, and they are text strings or names. Similarly, the Start Node and Start Facility fields have a joint lookup to the Facility table. This means that you must create a matching node and facility in the Facility parent table before you can assign vehicles to start at that facility in the VehFleet table. The two foreign key fields, Start Node and Start Facility in the VehFleet child table, must match the parent key fields, Facility Node and Facility Name, for a parent record in the Facility table. The lookup values are always the key fields of the parent table.

If the third column is not a lookup table, it represents a domain. For example, the Vehicle Fleet field has a domain of A15, which means any alphanumeric text string up to 15 characters in length. This means you are free to give any name you wish

to the Vehicle Fleet (no lookups are enforced). Of course, preferably the name is descriptive; in the figure, the vehicle fleet names tend to match the start node.

The field Number of Vehicles has a Domain of Short>=0, which means a nonnegative short integer (values between 0 and 32,767). Other typical numerical domains may incorporate ranges, such as 1,99 or 0,99999 or 0,15. Additional ranges include Long+/- (any integer), Double>=0 (any nonnegative floating point number), and reqqn (a nonnegative domain sized for requirement quantities).

The fourth column shown in the Data Dictionary is labeled Key? and displays a Y if the field is a key field. For the VehFleet table, the first three fields are key fields, as indicated in the figure. GDAS always lists key fields first for each table.

The key fields of a table may themselves be lookups. In the example, the first two key fields are lookups into the parent VehData table, whereas the third key field is a domain consisting of any 15 character alphanumeric string, with no lookup. The non-key fields may also be lookups or domains.

Additional information in the Data Dictionary shows whether the field is In or Out, meaning that it is either an input to the model or an output from the model. Some reference data is neither input nor output.

The Unit of Measure is indicated where appropriate. The Start Day Available field has a unit of measure indicated by day (hr), which means that data input is in whole days, but this is converted to hours for the hourly simulation used in the model itself. In general, the model performs all calculations in hours for higher accuracy in travel times and load rates, and to make cumulative differences in these parameters visible for sensitivity studies. Realistically, however, the data inputs (availability day, required delivery day, earliest delivery day, etc.) are not accurate even to the nearest day, so database inputs and outputs are typically stored in days rather than hours.

Finally, a description of the field is provided. All of this information is available on-line, while editing the tables, by pressing the F10 Menu key, then selecting Help/Data.

Directory Type: Reference

MEASCLAS Measure Class	Edit Limits Constant No	Defines the measurement classes (e.g. Cargo Quantity, Max Cargo Item Dimension, Vehicles Per Day, MOG or # Berths, Vehicle Dimension, etc.)

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Measure Class		A15			Measure class defining the area of applicability of different measures (e.g., Cargo Quantity, Dimension Limit, Vehicles/Day, Max Vehicles, Throughput, Storage)
2		Description		A100			General description of the measure class

MODELRPT Model Report	Edit Limits Constant No	Allows the user to specifiy which reports to generate from model outputs

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Report Table		TABLE			Lists the custom report tables that have queries to be generated after the model has been executed
2		Report Table Description		A40			Description of the Custom report table

REJTYPE Rejection Type	Edit Limits Constant No	Lists the available delay reason types

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Rejection Type		A15			Rejection reason type
2		Description		A50			Description of the rejection type

SCHEDTYP Scheduling Type	Edit Limits Constant No	Lists the scheduling model algorithm types

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Scheduling Model Type		A15			Scheduling model algorithm type
2		Level of Detail		A10			Level of detail for the scheduling algorithm
3		Description		A150			Brief description of the scheduling algorithm

VARYDIST Vary Distribution	Edit Limits Constant No	Stochastic or parametric distribution types for sampling data

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Distribution Type		A15			Stochastic data sampling distribution type

VARYPARD Vary Parametric Data	Edit Limits Constant No	Lists allowable tables and data fields for users to vary either parametrically or as time variations

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Table to Vary		A8			Table name which can be varied
2	Y	Field to Vary		A25			Field name which can be varied
3		Description		A255			Data field description

VARYSAVD Vary Storable Data	Edit Limits Constant No	Lists the allowable tables and fields which can be saved over multiple parametric or stochastic runs

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Table to Save		A8			Table name which has data that can be saved over multiple sensitivity runs
2	Y	Field to Save		A25			Nonkey data element which can be saved over sensitivity sampling runs
3		Description		A255			Data field description

Directory Type: Scenario

AGENTLEG Agent Route Mapping	Edit Limits	Selects the standard routes for each agent for map display

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	From Node		NODE			From node extracted from STDSTOP for the world map display
2	Y	To Node		NODE			To node extracted from STDSTOP for the world map display
3	Y	Transport Agent		A15			Transportation agent or company identifier for the fleet
4	Y	Planning Fleet		PLANFLT			Standard prescheduled route identifier
5		Standard Depart Interval		Short>=1		day	Standard depart time interval for a prescheduled route

BASMEAS Basic Measure	Edit Limits	Lists basic measures for reporting primary cargo quantities (Ston, Cbbl, Pax); each cargo class has a basic measure used for quantity splits

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Basic Quantity Measure	basemeas	MEASURE			Basic unit of measure for reporting cargo quantities (ston, cbbl, pax)
2			baseqnreq	Long>=0		Q	Basic quanity required accumulated for closure calculations for the current major unit
3			baseqndel	Long>=0		Q	Basic quanity delivered accumulated for closure calculations for the current major unit

CARGCLAS Cargo Class	Edit Limits	Lists the major cargo classes (e.g., Dry, PAX, POL) that define which dimensional measures are applicable to each cargo category and cargo type

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Class		A15			Cargo class (Dry, Pax, POL) which defines dimensional measures for cargo
2		Basic Quantity Measure		BASMEAS	Yes		Basic unit of measure for reporting quantity of this cargo class (ston, pax, cbbl)
3		Pounds Per Basic Quantity	lbsperqn	Long>=0	Yes	lbs/Q	Pounds per unit basic quantity in the basic unit of measure, used for conversion to accumulate short ton weight totals for vehicle loading or facility throughput
4		Has Accompanying Pounds?	hasaccomplbs	Yesflag			Yes if theater-dependent accompanying pounds per unit basic quantity are obtained from the THTRREQ table rather than a conversion factor (otherwise Pounds Per Basic Quantity field is used)
5		Is Pax?	ispax	Yesflag			Yes if the cargo class represents passengers, used to compute closure based on the MAJUNIT % closure criteria
6			basmeas	MEASURE			Basic unit of measure record number in the MEASURE table
7			firstclasmeas	CLASMEAS			First measure associated with this cargo class
8			basqnoffset	0,99			Offset of the basic quantity measure relative to the first quantity measure of this cargo class

CARGCONF Cargo Configuration	Edit Limits	Lists the cargo configurations used to containerize, package, or modify cargo for transport, and sets the time rate for configuration

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Configuration		A15			Cargo configuration which is used to package the cargo for transport on one or more modes
2		Configuration Rate	cfgrt	Short>=0		Q/hr	Rate at which cargo can be configured when changing configuration
3		Deconfiguration Rate	uncfgrt	Short>=0		Q/hr	Rate at which cargo can first be un-configured when changing configuration

CARGO Cargo	Edit Limits Output	Lists cargo derived from a single movement requirement and cargo category, which is loaded on a single trip, vehicle, and compartment

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Number		Record# BigSt			Cargo or shipment number
2		Requirement Id	crgreq	REQUIRE			Requirement identifier for this cargo
3		Cargo Category	crgcat	CARGOCAT			Cargo category which describes the kind of cargo being transported
4		Cargo Configuration	crgcfg	CARGCONF			Cargo configuration which is used to package the cargo for transport on one or more modes
5		Cargo Type	crgtyp	CARGTYPE			Cargo type for this cargo
6		Load Stop Number	ldstp	STOP			Load stop number for this cargo (in the model after planning prior to scheduling, this is the node number)
7		Unload Stop Number	uldstp	STOP			Unload stop number for this cargo (in the model after planning prior to scheduling,

Directory Type: Scenario

CARGO Cargo	Edit Limits Output	Lists cargo derived from a single movement requirement and cargo category, which is loaded on a single trip, vehicle, and compartment

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
							this is the node number)
8		Cargo Basic Quantity	crgqn	reqqn		Q	Cargo quantity in the basic unit of measure for its cargo class (ston, pax, cbbl)
9		Compartment Type	crgcpt	CPTTYPE			Vehicle compartment into which this cargo was loaded
10		Begin Load Day	begld	DayToHr		day (hr)	Day that the cargo begins loading (in the model prior to simulation, this is the earliest possible load time based on RLD or predecessor cargo or earliest theater depart minus 10)
11		End Load Day	endld	DayToHr		day (hr)	Day that the cargo completes loading (in the model prior to simulation this is the target lift time or planned begin load time)
12		Begin Unload Day	beguld	DayToHr		day (hr)	Day that the cargo begins offloading (in the model prior to simulation, this is also the earliest possible unload time based on EDD for final destination cargos)
13		End Unload Day	enduld	DayToHr		day (hr)	Day that the cargo is scheduled to complete offloading (this is updated during planning, scheduling, and simulation)
14		Is Attritted?	iscrgattr	Yesflag			Yes if the cargo is attritted in the last run results, blank otherwise
15		Attrit Probability %%	crgattrprob	0,9999		%%	Calculated cumulative probability of attrition (in %% or ten thousandths) for the cargo based on its route and schedule and including the probability of attrition of prior cargos
16		Cargo Predecessor	crgpred	CARGO			Unique predecessor cargo which immediately precedes this cargo and carries the same requirement (zero for an origin cargo)
17		Planning Fleet	planning_fleet	PLANFLT			Planning fleet selected by mode planning to move the cargo
18		Is Final?	isfinal	Yesflag			Yes if the cargo is a final leg to the requirement ultimate destination
19		Order Number	cargo_order	Long>=0			An order number that is assigned if the cargo is a resupply record, matching an order in RPTSUPST
20			nextcrgld	CARGO			After scheduling, next cargo at the same load stop; before scheduling, next cargo planned at the same POE node; after rejection, next cargo rejected; each cargo is always on 1 of 3 lists: LISTnodecrg(poenode), LISTcrg(poestop), or LISTcrgreject
21			nextcrguld	CARGO			Next cargo at the same unload stop after scheduling
22			crgstatus	0,9			Cargo status: WAITING=waiting for scheduling; REJECTED=rejected either in planning (crgtyp=0) or in scheduling (crgtyp>0); SCHEDULED=scheduled but not yet simulated; POESIM=loading at POE began simulation; PODSIM=unloading at POD began simulation
23			listcrgsucc	CARGO			List of successor cargos which immediately follow this predecessor cargo and which carry the same requirement
24			nextcrgsucc	CARGO			Next successor cargo with the same predecessor cargo
25			crgdue	DayToHr		hr	Planned time that the cargo is due to be delivered
26			iscrgreplanned	Yesflag			Yes if the cargo previously failed scheduling and was replanned
27			nextcrgonboard	CARGO			Next pointer for LISTcrgonboard and LISTcrgclose in final closure and attrition
28			quan_unloaded	reqqn			Basic quantity unloaded used for tracking simultaneous unload and load
29			quan_reloaded	reqqn			Basic quantity of a succesor of this cargo onloaded used for tracking simultaneous load and unload
30			load_delay	HoursDelay		hr	Hours of loading delay due to facility througput capacity
31			unld_delay	HoursDelay		hr	Hours of unloading delay due to facility throughput capacity
32			time_to_go	HoursDelay		hr	Estimated hours of travel to reach the requirement destination
33			nextmlistcargo	CARGO			Next pointer for the multicriteria list of cargos ready for scheduling
34			cargo_cbr	Long+/-		$/Q	Cargo cost benefit ratio for sorting the greedy vehicle list of cargos
35			is_resupply_pattern	Boolean			Flag to identify representative resupply cargos
36			nextsupstorecargo	CARGO			Next pointer for when the cargo is representative for a supply storage node

Directory Type: Scenario

CARGOCAT Cargo Category	Edit Limits	Lists the cargo categories which specifies the kind of cargo at the most detailed level, often based on JOPES three-position cargo category plus heavy lift code

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Category		A15			Cargo category which describes the kind of cargo being transported
2		Cargo Class	catclas	CARGCLAS	Yes		Cargo class (Dry, Pax, POL) which defines dimensional measures for this cargo category
3		Category Code		A4			Four position JOPES cargo category code including heavy lift code (A0=vehicle NAT, B0=NSDA NAT, B1=NSDA outsize, B2C=NSDA oversize noncont, etc.)
4		Discrete Load Increment	cat_min_split_size	Long>=1	Yes	Q	Discrete size increment for loading this cargo, expressed in the basic unit of measure; if specified, a split cargo must be an integer multiple of the size increment
5		Configuration at Origin	configorig	CARGCONF	Yes		Starting cargo configuration at the origin for this cargo category
6		Is Ammunition?	cat_is_ammo	Yesflag			Yes if the cargo category is treated as hazardous ammunition in route sequence, i.e. it is constrained to be last on and first off in multi-port routes
7		Description		A100			Description of the cargo category
8			firstcatmeas	CATMEAS			First measure for this cargo category in the CATMEAS table
9			listexcrgcat	EXCLUDE			List of exclusions for this cargo category, if any
10			firstsupstore	SUPSTORE			First supply theater record for this cargo category

CARGTYPE Cargo Type	Edit Limits	Lists the cargo types, which define kinds of cargo affecting stow factors, load rates, and load compatibility for a specific mode of transport

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Type		A15			Mode-specific cargo type which groups cargo categories for a given transport mode in order to define stow factors, load rates, and load compatibility for vehicle compartments
2		Cargo Class	crgtypclas	CARGCLAS	Yes		Cargo class (Dry, Pax, POL) which defines dimensional measures for this cargo type
3		Transport Mode	crgmod	MODE	Yes		Transport mode associated with this mode-specific cargo type
4		Cargo Type Description		A100			Description of the mode-specific cargo type
5			liststowpen	STOWPEN			List of STOWPEN records and associated compartment types in preferred order for this cargo type
6			crgtypoffset	CARGTYPE			Cargo type offset within its mode of transport for direct access of stow factors and stow penalties

CATMEAS Category Measure	Edit Limits Display Onl	Lists the dimensional measures applicable to each cargo category; generated automatically from the CLASMEAS table to provide a lookup for REQQUAN quantities

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Category	catmeascat	CARGOCAT			Cargo category which describes the kind of cargo being transported
2	Y	Cargo Measure	catmeasmeas	MEASURE			Name of a measure (basic or nonbasic) for specifying cargo quantity or dimensions

CATMODE Cargo Category Mode	Edit Limits Keys Full	Lists the conversion of cargo categories to mode-specific cargo types which define stow factors and load rates for each vehicle type

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Transport Mode		MODE			Transport mode
2	Y	Cargo Category		CARGOCAT			Cargo category which describes the kind of cargo being transported
3	Y	Cargo Configuration		CARGCONF			Cargo configuration status
4		Cargo Type	catmodcrgtyp	CARGTYPE			Cargo type used to represent this cargo category and configuration for the specified transport mode (leave cargo type blank if the transport mode cannot carry the category or configuration, e.g. NSDA via Airlift)

CLASMEAS Cargo Class Measure	Edit Limits	Lists the major classes of cargo and what quantity measures are applicable

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Class		CARGCLAS			Cargo class (Dry, Pax, POL) which is associated with specific quantity measures
2	Y	Cargo Measure	cclasmeas	MEASURE			Type of measure used for specifying quantity of cargos in this cargo class

Directory Type: Scenario

CONSRATE Consumption Rate	Edit Limits Output	Contains the computed static consumption rate for units at destinations

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Unit Destination		NODE			Destination node for a requirement type that consumes resupply
2	Y	Consumed Cargo Category	supstore_record	SUPSTORE			Supply cargo type that is consumed by other requirements at their destination
3		Supply Storage Node		SUPSTORE			Supply storage node or terminal
4			consumption_rate	Long>=0			Total current consumption rate for all requirement types consumming the supply type at this destination
5			consumed_cargocat	CARGOCAT			Cargo category consumed

CONVOY Convoy	Edit Limits	Specifies information about convoy routes which are to be used for sealift when traveling between the assembly node theater and the disassembly node theater

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Convoy Assembly Node	cnvyassfac	FACILITY			Assembly node for ships and escorts on this convoy route (normally in the origin theater)
2	Y	Assembly Facility		FACILITY			Assembly facility for ships and escorts on this convoy route
3	Y	Convoy Disassembly Node	cnvydisfac	FACILITY			Final disassembly node for ships and escorts on this convoy route (normally in the destination theater)
4	Y	Disassembly Facility		FACILITY			Final disassembly facility for ships and escorts on this convoy route
5		Convoy Route Type	cnvyrouttype	ROUTTYPE	Yes		Convoy route type which can accomodate all ships in the convoy
6		Convoy Vehicle Per Escort	escortships	1,999	Yes		Number of ships handled by each escort (used to compute the number of escorts)
7		Convoy Speed	cnvyspeed	1,999	Yes	nmi/hr	Speed at which all convoy ships travel on this convoy route, in nautical mph
8		Convoy Delay Hours	cnvydel	HoursDelay		hr	Additional convoy transit delay time in hours for management operations, diversions, assembly and disassembly operations, etc. after the convoy assembly day and before the convoy disassembly
9		Convoy Interval Days	cnvyinterval	DaysDelayToHr	Yes	day	Minimum time interval in days between scheduled convoy departures
10		Convoy Min Vehicles	cnvyminships	0,999			Minimum number of ships permitted in a convoy trip
11		Convoy Max Vehicles	cnvymaxships	0,999			Maximum number of ships permitted in a convoy trip
12		Max Vehicle Wait Days	cnvymaxwait	DaysDelayToHr		day	Maximum ship waiting time to assemble a minimum size convoy beyond which the ship sails independently
13		Link Attrit Multiplier %	cnvylinkattrmult	%		%	Convoy link attrition multiplier for ships in this convoy
14		Node Attrit Multiplier %	cnvynodeattrmult	%		%	Convoy node attrition multiplier for ships in this convoy
15			cnvyattr	Short>=0		%%	Precomputed discrete attrition for a convoy from assembly to disassembly including both node and link attrition factors
16			cnvytime	HoursDelay		hr	Precomputed convoy travel time from assembly to disassembly including link delays, link distances at convoy speed, and additional convoy delay time
17			listcnvytrip	TRIP			List of trips in the next convoy trip currently being assembled
18			cnvylastsent	CONVTRIP			Last convoy trip scheduled for departure at this convoy location
19			cnvybuildup	CONVTRIP			Current convoy trip being accumulated prior to reaching the minimum size and being scheduled for departure

CONVTRIP Convoy Trip	Edit Limits Output	Stores information about convoy trips

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Convoy Trip Number		Record# Vehic			Convoy trip number
2		Convoy Assembly Node	cnvy	CONVOY			Assembly node for this convoy trip
3		Assembly Facility		CONVOY			Assembly facility for this convoy trip
4		Convoy Disassembly Node		CONVOY			Final disassembly node for ships and escorts on this convoy trip
5		Disassembly Facility		CONVOY			Final disassembly facility for ships and escorts on this convoy trip
6		Convoy Assembly Day	cnvyadep	DayToHr		day (hr)	Depart day of the convoy at the assembly point
7		Convoy Disassembly Day	cnvyddep	DayToHr		day (hr)	Depart day of the ships in the convoy at the disassembly point
8		Convoy Size	cnvysize	1,99			Number of ships in the convoy
9		Number of Escorts	cnvyescrts	1,99			Number of escorts in the convoy

Directory Type: Scenario

CPTMEAS Compartment Measure	Edit Limits	Lists the measures for defining compartment capacity

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Compartment Type		CPTTYPE			Compartment type name used to specify stow factors for vehicle types and capacities for vehicles
2	Y	Compartment Measure	meas	MEASURE			Unit of measure for defining compartment capacity (in addition to the total ston measure which is always used for each vehicle)
3			firststowfact	STOWFACT			First stow factor for this compartment type and measure

CPTTYPE Compartment Type	Edit Limits	Defines vehicle compartment types

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Compartment Type		A15			Generic compartment type name which is associated with stow factors and vehicle capacities (e.g., Hold for ships, Outsize for aircraft, Boxcar for rail, Flatbed for motor)
2		Transport Mode	cptmod	MODE	Yes		Transport mode associated with this compartment type
3			firstcptmeas	CPTMEAS			First compartment measure for defining compartment capacity
4			cptldqn	reqqn		Q	Cargo quantity which could be loaded on each compartment for the current insertion cargo
5			cptbestqn	reqqn		Q	Quantity of the best cargo so far which can be loaded on each compartment
6			firststowpen	STOWPEN			First stow penalty record for this compartment type

EXCLUDE Exclusion	Edit Limits	Sets user-definable exclusions for cargo loading, based on various combinations of factors such as Mode, Vehicle Type, Cargo Category, Planning Fleet, Node, Theater, and

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Exclusion Label		A15			Label for a user-defined combination of factors to exclude cargo loading at POEs and unloading at PODs
2		Node Excluded for Loading	exnode	NODE			Excluded node for loading and offloading, if any (blank if not applicable, i.e., this exclusion applies to all nodes and is independent of node)
3		Facility Type Excluded	exfactyp	FACTYPE			Excluded facility type for loading and offloading, if any (blank if not applicable, i.e. exclusion record applies to all facility types or is independent of facility type)
4		Requirement Type Excluded	exreqtyp	REQTYPE			Excluded requirement type, if any (blank if not applicable)
5		Vehicle Type Excluded	exvehtyp	VEHTYPE			Excluded vehicle type, if any (blank if not applicable)
6		Planning Fleet Excluded	exfleet	PLANFLT			Excluded planning fleet, if any (blank if not applicable)
7		Theater Excluded	exthtr	THEATER			Excluded theater, if any (blank if not applicable)
8		Cargo Category Excluded	excrgcat	CARGOCAT			Excluded cargo category, if any (blank if not applicable)
9		Mode Excluded	exmode	MODE			Excluded transport mode, if any (blank if not applicable)
10			excount	0,7			Computed count of nonzero secondary fields in this exclusion record (each exclusion has at least one nonzero primary field)
11			nextexnode	EXCLUDE			Next exclusion for the same node
12			nextexfactyp	EXCLUDE			Next exclusion for the same facility
13			nextexreqtyp	EXCLUDE			Next exclusion for the same requirement type
14			nextexvehtyp	EXCLUDE			Next exclusion for the same vehicle type
15			nextexfleet	EXCLUDE			Next exclusion for the same fleet
16			nextexthtr	EXCLUDE			Next exclusion for the same theater
17			nextexcrgcat	EXCLUDE			Next exclusion for the same cargo category
18			nextexmode	EXCLUDE			Next exclusion for the same mode

FACCAP Facility Capacity	Edit Limits	Specifies facility limits and constraints on cargo throughput for different facility measures

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Facility Node		FACILITY			Node with one or more facilities
2	Y	Facility Name		FACILITY			Facility name at this node
3	Y	Facility Capacity Measure	facmeas	MEASURE			Cargo storage or throughput handling capacity measure for this facility
4		Facility Capacity	faccap	faccap		Q or Q/hr	Hourly rate or total storage cargo handling capacity for this measure and facility at

Directory Type: Scenario

FACCAP Facility Capacity	Edit Limits	Specifies facility limits and constraints on cargo throughput for different facility measures

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
							the node
5			faccapstor	faccap		Q	Remaining storage capacity if the measure is storage
6			faccapsathrs	HoursDelay		hr	Start hour on the current day when this facility storage capacity measure became saturated (0 if unsaturated)

FACILITY Facility	Edit Limits	Lists port facilities at nodes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Node	facnode	NODE			Node with one or more facilities
2	Y	Facility Name		A15			Facility name at this node
3		Facility Type	factyp	FACTYPE	Yes		Facility type for this facility
4		Max Vehicles Per Hour	facvph	facvph		veh/hr	Number of combined vehicle arrivals and departures which can be handled per hour in this facility during its hours of operation
5		Max Parking	facpark	Short>=0		veh	Maximum number of "standard" vehicles permitted in the facility at the same time, e.g. working MOG for airlift or number of berths for sealift (vehicle types are weighted by an effective factor to convert to a standard vehicle) (model scales by 100 to %)
6		Operating Hours/Day	fachpd	0,24		hr/day	Operating hours per day that the facility is open
7		Facility Length	faclen	Short>=0		ft	Maximum length available (e.g., runway length for air, berth length for sea)
8		Facility Width	facwid	0,999		ft	Maximum width available (e.g., runway width for air, berth beam for sea)
9		Facility Dimension	facdim	0,999		varies	Maximum vehicle dimension allowed in the facility, a user-definable criterion, such as draft for sealift
10		Facility Rating	facrating	Short>=0		varies	Facility rating which limits the maximum allowable vehicle rating, based on a user-definable critieria (e.g., load classification number for air, boom capacity or sea)
11			facvphused	facvph		veh/hr	Number of arrivals and departures used up at the facility for the current hour
12			firstfaccap	FACCAP			First facility measure constraint for this facility
13			fachrpt	FACCAPHR			First record in the FACCAPHR table, if any, for this facility on the current simulation day
14			facstoroffset	MEASURE			Offset for the first FACCAP record for storage relative to the first record
15			facthrupoffset	MEASURE			Offset for the first FACCAP record for throughput relative to the first record
16			facparkusedpc	Long>=0		%	Number of "standard" vehicle parking spaces used in the facility for the current facility hour, expressed in percent
17			faccurtime	Time			Last simulation transaction time for this facility
18			currptfveh	RPTFVEH			Last RptFVeh report record tracking vehicle throughput for this facility
19			isfacinuse	Yesflag			True if the facility is in use for vehicle flow simulation
20			listfacevent	FACEVENT			Pointer to the list of events for this facility in deposition order
21			predfacevent	FACEVENT			Pointer to the last begin pred used by the subtract capacity function

FACTYPE Facility Type	Edit Limits	Lists the available facility or berth types which are used to define load rates at port facilities

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Facility Type		A15			Facility or berth type name for airports or seaports or other mode facilities (e.g. Container Ammo for sealift, or Airport Wide Body for airlift)
2		Transport Mode	facmode	MODE	Yes		Transport mode for this facility or berth type
3			listexfactyp	EXCLUDE			List of exclusions or constraints for this facility type, if any
4			factypoffset	FACTYPE			Facility type offset within its mode of transport

Directory Type: Scenario

FLEET Edit Limits Administrative Fleet	Identifies groups of vehicles with common administrative characteristics for vehicle availability.

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Fleet		A15			Fleet name
2		Planning Fleet	planflt	PLANFLT	Yes		Planning fleet to which this fleet belongs
3		Vehicle Capacity Percent	fleetvehcappc	0,100	Yes	%	Percent of each lift vehicle which is available, applied uniformly across all vehicles in the Fleet

LATECLAS Edit Limits Lateness Class	Defines lateness classifications for the RPTLATE lateness summary report (e.g. On Time, Within 1 Day Late, Total Scheduled, Total Unscheduled, etc.)

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Lateness Class		Lateness Clas			Lateness classification for reporting lateness summaries (e.g., Ontime, Scheduled, Unscheduled, Within 1 Day Late, etc.)
2		Days Late	lateclasdays	DaysDelayToHr	Yes	day	Maximum days late allowed for inclusion in this lateness classification

LINKCAP Edit Limits Node Link Capacity	Defines the capacity for constrained links and units of measure

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	From Node		NODELINK			From node for this link with link capacity
2	Y	To Node		NODELINK			To node for this link with link capacity
3	Y	Transport Mode		NODELINK			Transport mode for this link with link capacity
4	Y	Link Capacity Measure	linkcap_measure	MEASURE			Unit of measure for this link capacity
5		Link Capacity Limit	nodelink_capacity	Long>=0		Q/h	Limit on cargo throughput capacity for this link
6			firstlinkcap_event	LNKEVENT			First event for this capacitated link

LOADRATE Edit Limits Load Rate Keys Comput	Specifies transfer rates for loading and unloading

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Type		VFACTYPE			Vehicle type
2	Y	Facility Type		VFACTYPE			Facility type at the node
3	Y	Cargo Type	ldratecrgtyp	CARGTYPE			Cargo type for the transport mode
4		Hourly Load Rate	ldrate	Short>=0		Q/hr	Hourly load rate to load this cargo category grouping on this vehicle type at this berth type expressed in the cargo basic quantity units (loading can occur only during the facility open hours)
5		Hourly Unload Rate	uldrate	Short>=0		Q/hr	Hourly unload rate to unload this cargo category grouping on this vehicle type at this berth type expressed in the cargo basic quantity units (unloading can occur only during facility open hours)
6		Cargo Throughput Scaling	thruputscale	Byte>=0	Yes	%	Cargo throughput scaling which adjusts the cargo's required facility and node throughput capacity (100% represents standard throughput scaling, 0% means the cargo does not affect throughput capacity at all, 50% means the cargo consumes half throughput)

MAJUNIT Edit Limits Major Unit	Lists each major unit, which in GDAS is a grouping of requirements, either unit or non-unit, used to display delivery profiles and compute overall closure times for related

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Major Unit		A20			Major unit name for analysis of requirement closures and measures of effectiveness
2		Requirement Type	majunitreqtyp	REQTYPE	Yes		Requirement type for this major unit
3		Major Unit MOE	majunitmoe	0,150			Measure of effectiveness (MOE) rating for this major unit (e.g., brigade count or combat power) as defined by the analyst to compute cumulative MOE delivery
4		Computed Closure Day	majunitclose	DayToHr		day (hr)	Closure day for the major unit based on both the Pax and cargo closure minimum % specified in the MajUnit table
5		Closure Required Cargo %	majunitcrgclose	%		%	Minimum percent of the cargo which must be delivered in order to calculate unit closure (if the % is never attained, closure is based on the last portion delivered)
6		Closure Required PAX %	majunitpaxclose	%		%	Minimum percent of the passengers which must be delivered in order to calculate unit closure (if the % is never attained, closure is based on the last portion delivered)
7		Major Unit Description		A50			Major unit description

Directory Type: Scenario

MAPLAYER	Edit Limits	Sets mapping layer characteristics such as color and symbol which can be edited by the user
Mapping Layer Specs		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Layer ID		Table Any Cas			The unique layer ID (generated as a table in the mapping application)
2		Layer Label		Menu Item	Yes		Layer description used in the mapping application menus
3		Map Table		MAPTABLE	Yes		Lookup into the MapTable table for the original table
4		Layer Value		A255	|Ye		The Layer Field value for this layer (may be blank only if the table is all on one layer)
5		Begin Off		A3			Yes if the layer display should be off initially
6		Symbol Type		A25MAPSHAPE			The mapping symbol shape or line type
7		Symbol Color		MAPCOLOR			The color of the symbol
8		Symbol Size		0,48			The point size of the node symbol or line width
9		Symbol Min Scale		Short>=0		mi	The minimum scale (closest in) for which this layer is displayed, express as width of view in miles
10		Symbol Max Scale		Short>=0		mi	The maximum scale (farthest out) for which this layer is displayed, expressed as width of view in miles
11		Label Font		MAPFONT			The font type for the layers labels
12		Label Style		MAPFSTYL			The font style for the layer labels
13		Label Color		MAPCOLOR			The font color for the layer labels
14		Label Size		Short>=0			The font point size for the layer labels
15		Label Min Scale		Short>=0		mi	The minimum scale for which the label is displayed, expressed as width of image in miles
16		Label Max Scale		Short>=0		mi	The maximun scale for which the label is displayed, expressed as width of image in miles

MAPLINK	Edit Limits	Lists route links extracted from NODELINK for the world map display
Map Link		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	From Node		NODELINK			From node extracted from NodeLink for the world map display
2	Y	To Node		NODELINK			To node extracted from NodeLink for the world map display
3	Y	Transport Mode		NODELINK			Transport mode for this link (only one link is permitted for each mode; multiple links can be created by adding nodes)
4		Is Link Disabled?		Yesflag			Yes if the link is available, blank otherwise

MAPNODE	Edit Limits	Lists nodes and locations extracted from NODE for the world map display
Map Node		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Node Name		NODE			Node name or location extracted from NODE for the world map display
2		Node Type		NODETYPE			Node type for world map graphics display
3		Node Latitude		Lat	Yes	deg min H	Node latitude in dd mm H
4		Node Longitude		Lon	Yes	deg min H	Node longitude in ddd mm H
5		Is Node Disabled?		Yesflag			Yes if the node is disabled, otherwise blank

MAPREQ	Edit Limits	Summarizes requirement quantities by origin/destination channel for mapping
Map Req Channels	Output	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Origin		NODE			Origin of this flow channel
2	Y	Destination		NODE			Destination of this flow channel
3	Y	Cargo Measure		BASMEAS			Basic cargo quantity measure
4		Total Quantity		Double>=0		Q	Total quantity for this flow channel and basic measure

MAPTABLE	Edit Limits	Defines the map table specifications
Mapping Table Specs	Hide	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Map Table		TABLE			The name of a mapping source table
2		Map Type		MAPTYPE	Yes		The type of mapping display for this table (Node or Link)
3		Number Keys		1,7			The number of keys is the source node table
4		Parent Table		MAPTABLE			The node source table for link mapping tables
5		Browse Table		TABLE			A table with additional browse information about the records in the map table (this table have initial keys matching Map Table)

Directory Type: Scenario

MAPTABLE Mapping Table Specs	Edit Limits Hide	Defines the map table specifications

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
6		Browse File		A12			A report file with additional browse information about the records (this report must have searchable text with matching key field values, with multiple key field strings separated by commas)
7		Chart Table		TABLE			A table with charting information, first keys must match the mapping table, followed by an optional key field for crosstab headings (such as Product), followed by a key field such as Date for the x axis, followed by a chart value
8		Layer Field		A25			The layer selection field for the mapping table (blank if the entire table is plotted on one layer)
9		Latitude Field		A25			The latitude field for a node table
10		Longitude Field		A25			The longitude field for a node table
11		Picture Field		A25			The picture name field for a node table
12		Label Field		A25			The label field for the mapping table
13		Is Disabled Field		A25			Field which determins if this object is disabled
14		Remove Reverse Links		Yesflag			Yes for a map link table for which reverse links are to be removed, otherwise blank
15		Subset Table		TABLE			The table to be used for subset values, with the first keys matching the Map Table, and an additional key representing disjoint subsets (e.g. location date)
16		Subset Field		A25			The dynamic subsetting field for the mapping table

MAPTHRUP Map Node Thruput	Edit Limits Output	Summarizes node daily throughput quantities for map chart display

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Node		NODE			Node for map throughput chart
2	Y	Measure		MEASURE			Cargo quantity measure for throughput chart
3	Y	Day		simendday		day	Day for map throughput chart
4		Quantity		Double>=0		Q	Total throughput quantity for this node, day, and quantity measure

MAPVEH Map Vehicle	Edit Limits Output	Lists vehicles extracted from VEHICLE for the world map display

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Number		VEHICLE			Vehicle unique sequential number extracted from the VEHICLE table for the map display
2		Vehicle Type		VEHFLEET			Vehicle type
3		Vehicle Identifier		VEHFLEET			Vehicle identifier
4		Vehicle Fleet		VEHFLEET			Vehicle fleet for this vehicle
5		Mode		MODE			Transport mode for this vehicle
6		Latitude Computed		Lat		deg min H	Current latitude computed for the current date and time
7		Longitude Computed		Lon		deg min H	Current longitude computed for the current date and time

MEASURE Measure	Edit Limits	Lists the types of dimensional measures used to define cargo, vehicle compartments, or node facilities

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Measure Type		A15			Type of measure used for describing cargo, vehicle compartments, or node facilities (e.g., Ston, Mton, Sq Ft, CBbl, Max Ft., Max Item Ston, etc.)
2		Measure Class	measclas	MEASCLAS	Yes		Measure class for this measure type
3		Matching Cargo Measure	meascrgmeas	MEASURE	Yes		Matching cargo measure which is used for calculating constraints using this constraint measure
4		Unit of Measure		A25			Unit of measure for this type of measure
5			basicmeas	BASMEAS			Basic measure corresponding to this measure, if any
6			measrptmeas	RPTMEAS			The matching record in RPTMEAS corresponding to this measure, if any

MISSION Mission	Edit Limits	Lists special missions such as TACS, AFOE, etc.

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Special Mission		A15			Name of a special mission, e.g. Marine amphibious task force, or crane ship, or other mission
2		Mission Begin Day	missbeg	DayToHr		day (hr)	Begin day that a designated special mission ship or fleet is restricted to matching

Directory Type: Scenario

MISSION Mission	Edit Limits	Lists special missions such as TACS, AFOE, etc.

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
							special-mission requirements only
3		Mission End Day	missend	DayToHr		day (hr)	End day that a designated special mission ship or fleet is restricted to matching special-mission requirements only
4		Delay Hours After Offload	missdelay	HoursDelay		hr	Additional delay hours in the depart time after offload of special mission cargo at its ultimate destination node (delays the vehicle at the stop, not the cargo delivery)

MODE Mode of Transport	Edit Limits	Lists transportation modes (air, sea, motor, organic, rail, intratheater air, etc.)

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Transport Mode		A15			Name of a transport mode (e.g. Airlift, Sealift, Rail, Motor, Pipeline, Generic, etc.)
2		Scheduling Model Type	schedtype	SCHEDTYP	Yes		Scheduling model algorithm type used for this mode of transport
3		ASCII Code Abbreviation	modechar	ASCII Upper			ASCII code of a single upper case letter abbrieviation used by the model to display on-screen activity progress (S for Sea, A for Air, etc., with lower case for planning and upper case for scheduling and simulation)
4			listexmode	EXCLUDE			List of exclusions for this mode, if any
5			listvehtype	VEHTYPE			List of vehicle types for this mode
6			maxrange	Short>=0			Max empty range and max link distance over all vehicles of this mode
7			cancnvy	Boolean			Flag that is set to TRUE if a mode can convoy, FALSE otherwise
8			hasmission	Boolean			Flag that is set to TRUE for the current mode if the requirement has a mission
9			listmodefleet	PLANFLT			List of planning fleets for this mode

NODE Node	Edit Limits	Lists nodes and locations for all ports, origins, destinations, transhipment points, and routing points

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Node Name		A15			Node name corresponding to a port, transhipment point, origin, destination, routing point etc.
2		Node Type		NODETYPE			Node type for world map graphics display
3		Node Latitude	nodelat	Lat	Yes	deg min H	Node latitude in dd mm H
4		Node Longitude	nodelon	Lon	Yes	deg min H	Node longitude in ddd mm H
5		Geoloc Code	nodegeoloc	A4			Node geoloc code, if any
6		Theater	nodethtr	THEATER	Yes		Theater that the node is located in, if any
7		Attrit Probability %%	nodeattr	0,9999		%%	Discrete probability of attrition or breakdown when departing this node
8		Is Node Disabled?	isnodegone	Yesflag			Yes if the node is disabled, otherwise blank
9			firstlink	NODELINK			Node first link
10			firstfac	FACILITY			Node first facility
11			firstnodecap	NODECAP			First node throughput in the NODETHRU table, if any
12			listexnode	EXCLUDE			List of exclusions for this node, if any
13			nodehrptr	NODCAPHR			First record in the NODCAPHR table, if any, for this node on the current simulation day
14			nodehpd	0,24			Node operating hours per day based on the maximum facility hours at the node
15			nodestoroffset	MEASURE			Offset for the first NODECAP record for storage relative to the first record
16			nodethrupoffset	MEASURE			Offset for the first NODECAP record for throughput relative to the first record
17			firstconvoy	CONVOY			Node first convoy record (currently not input in Preprocessor because of file limits)
18			prednode	NODE			Predecessor node in the shortest spanning tree algorithm in NetTool
19			label	Long>=0			Distance from the root in the NetTool shortest spanning tree algorithm
20			join_label	Boolean			Temporary flag for finding the common root of two nodes in the NetTool spanning tree algorithm
21			listlink	NODELINK			List of links at the node in NetTool
22			listnodevent	NODEVENT			Pointer to list of nodevent records for this node
23			listcargo	CARGO			List pointer for the multicriteria list of cargos, paralleling mheapcargo
24			nextnode	NODE			Next pointer for the list of nodes
25			prednodevent	NODEVENT			Pointer to the last begin pred nodevent record accessed by the subtract capacity function

Directory Type: Scenario

NODE Node	Edit Limits	Lists nodes and locations for all ports, origins, destinations, transhipment points, and routing points

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
26			firstconsrate	CONSRATE			First supply consumption rate for this node

NODE2 Shadow Node	Edit Limits Display Onl	Provids a shadow copy of the NODE table for form and report linkages

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Node Name		NODE			Node name corresponding to a port, transhipment point, origin, destination, routing point etc.
2		Node Type		NODETYPE			Node type for world map graphics display
3		Node Latitude		Lat	Yes	deg min H	Node latitude in dd mm H
4		Node Longitude		Lon	Yes	deg min H	Node longitude in ddd mm H
5		Geoloc Code		A4			Node geoloc code, if any
6		Theater		THEATER	Yes		Theater that the node is located in, if any
7		Attrit Probability %%		0,9999		%%	Discrete probability of attrition or breakdown when departing this node
8		Is Node Disabled?		Yesflag			Yes if the node is disabled, otherwise blank

NODECAP Node Capacity	Edit Limits	Defines total throughput at each node for all facilities at the node

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Node Name	thrupnode	NODE			Node having throughput or storage limits
2	Y	Node Capacity Measure	nodemeas	MEASURE			Unit of measure for overall cargo handling capacity at the node
3		Total Node Capacity	nodecap	nodecap		Q or Q/hr	Hourly throughput rate or total storage cargo handling capacity at the node for all facilities combined
4			nodecapstor	nodecap		Q	Remaining storage capacity if the measure is storage
5			nodecapsathrs	HoursDelay		hr	Start hour on the current day for which this facility storage capacity measure became saturated (0 if unsaturated)

NODELINK Node Link	Edit Limits	Lists single leg links between nodes for transportation

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	From Node		NODE			From node name
2	Y	To Node	linktonode	NODE			To node name
3	Y	Transport Mode	linkmode	MODE			Transport mode for this link (only one link is permitted for each mode; multiple links can be created by adding nodes)
4		Is Link Disabled?	islinkgone	Yesflag			Yes if the link is disabled and unavailable, blank otherwise
5		Link Dist	linkdist	Short>=0		nmi	Link distance in nautical miles, computed by the model based on great circle if 0, or can also be set by the user (but will be recalculated as the great circle distance if less than the great circle distance)
6		Added Delay Hours	linkdelay	HoursDelay		hr	Delay time on this link in hours
7		Speed Change	linkspeedincr	-99,999		nmi/hr	Speed change (positive for increase, negative for decrease) which is added to the transport speed on this link (for sealift an approximate calculation is to get an equivalent distance change), in nautical mph
8		Speed Limit	linkspeedlim	1,999		nmi/hr	Speed limit which constrains the allowable transport speed on this link (for sealift an approximated distance change is computed), in nautical mph
9		Link Rating	linkrating	0,9999			User-definable link rating which limits the size of vehicles that are permitted through this link, based on their Route Type; for example, the Link Rating may represent maximum canal draft, excluding deep draft ships
10		Attrit Daily Rate %%	linkattr	0,9999		%%/day	Attrition or breakdown rate on this link for exposure-based attrition
11			is_barrier	Boolean			Boolean flag set to one if a link is an obstacle rather than a transport path, zero otherwise
12			nextlink	NODELINK			Next link at the same node in NetTool
13			track_count	Short>=0			Count of the number of times a link has appeared in a route
14			firstlinkcap	LINKCAP			First pointer to a link capacity record
15			listlnkevent	LNKEVENT			List pointer to list of events for this link, if any

Directory Type: Scenario

NODETYPE	Edit Limits	Lists the node types for world map display
Shape		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Node Type		A15			Node type for world map display

PARAM	Edit Limits	Sets parameters for the scheduling model
Parameter	Modify	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Scenario Name		A8			Scenario short name and directory name
2		Scenario Description		A50			Scenario description
3		Vehicle Snapshot Day	currday	simendday		day	Current day used to interpolate vehicle locations for the world map display
4		Vehicle Snapshot Hour	currhr	Hour		hour	Current hour used to interpolate vehicle locations for the world map display
5		Security Classification		CLASSIF			Security classification level of the data
6		Last Simulation Day	simendday	simendday	Yes	day	Last day to simulate
7		Do Dynamic Resupply?	dodynres	Yesflag			Yes if dynamic resupply generation is to be performed in the model
8		Do Static Resupply?	dostatres	Yesflag			Yes if static resupply requirement generation is to be performed (can be left blank to re-use the dynamic resupply computed from a prior run)
9		Static Order Interval	order_interval	1,99		day (hr)	Aggregation interval for computing resupply order quantities
10		Do Convoying?	docnvy	Yesflag			Yes if convoying is to be performed using the CONVOY table, blank otherwise
11		Do Convoy At Intervals?	docnvyinterval	Yesflag			Yes if convoys are to be scheduled at regular intervals independent of convoy size (convoys can then be scheduled more efficiently)
12		Convoy Begin Day	cnvybeg	DayToHr		day (hr)	Day that convoy operations begin
13		Max Speed Convoyed	cnvymaxspeed	1,99	Yes	nmi/hr	Max speed limit above which ships are not convoyed and instead travel independently, in nautical mph
14		Max Convoy Diversion	cnvymaxdivert	Short>=0	Yes	nmi	Max diversion distance above which ships are not convoyed and instead travel independently, in nautical miles
15		Do Attrition?	doattrit	Yesflag			Yes if attrition or breakdown is to be performed, blank otherwise
16		Do Parameter Vary?	doparam	Yesflag			Yes if parametric variations are to be performed, blank otherwise
17		Number of Stochastic Runs	nstatruns	0,99			Number of runs if stochastic simulation is performed using probability distributions
18		Personnel Lead Days	prsnleadtim	DaysDelayToHr		day (hr)	Earliest lead time that personnel can arrive prior to other cargo in the same requirement
19		Random Number Seed	seed	Short>=0			Random number seed for stochastic simulations including attrition
20		Minimum Vehicle Load %	vehminpc	%		%	Minimum percent of the total vehicle compartment capacity which must be filled to be worth assigning a cargo, unless the Minimum Cargo Load % below is satisfied
21		Minimum Cargo Load %	crgminpc	%		%	Minimum percent of a cargo which must be loadable to be worth assigning a cargo to a vehicle, unless the Minimum Vehicle Load % above is satisfied
22		Do Balanced Forces?	balance_forces	Yesflag			Flag to dynamicaly replace reqtype priority with percent delivered
23			totncrg	Long>=0			Total number of cargos to be planned, used in displaying progress on screen
24			nrofcpt	CPTTYPE			Number of compartments for the current vehicle type with capacities stored in VCPTMEAS
25			curday	0,999		day	Current day in the simulation model (not converted to hours)
26			tvstartrec	TIMEVARY			Current starting record in the TIMEVARY table for updating the next set of time variations
27			maxnomspeed	Long>=0		nmi/hr	Max planning mode speed for calculating lower bounds, in nautical mph
28			mintonmipen	Long>=0		mils/ton/n	Max ton-mile penalty scaled by 1000 (in mils/ton/mi) used for mode planning lower bounds (equals min of 1000*nompen/nomspeed over all modes)
29			simend	DayToHr		hr	Simulation ending hour for the model, including an extra shutdown day
30			cnvyminspeed	Short>=0		nmi/hr	Required minimum speed for ships to convoy (computed as the max convoy speed), in nautical mph
31			listcrgonboard	CARGO			List of cargos onboard the current trip in expected value attrition calculations
32			listcrgreject	CARGO			List of rejected cargos which could not be scheduled
33			curdayfirsthr	DayToHr		day (hr)	First hour of the current simulation day
34			tottons	Long>=0		ston	Total requirement tonnage used for the onscreen display of progress (including

Directory Type: Scenario

PARAM Parameter	Edit Limits Modify	Sets parameters for the scheduling model

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
							other basic measures converted to stons)
35			totintransit	Long>=0		ston	Total intransit tonnage used for the onscreen display of progress (including other basic measures converted to stons)
36			totdelivered	Long>=0		ston	Total delivered tonnage used for the onscreen display of progress (including other basic measures converted to stons)
37			listcrgflow	CARGO			List of vehicle flow cargo's which have been partially scheduled
38			listnode	NODE			List of nodes with cargos ready for scheduling, sorted by the earliest scheduling priority of cargos at each node
39			listgreedyveh	CARGO			List of cargos suitable for loading on a greedy vehicle
40			last_resupply_order	Long>=0			Last resupply order number saved for snapshot restarts

PLANFLT Planning Fleet	Edit Limits	Lists the fleet aggregations used for planning modes, ports, cargo configurations, and pre-scheduled routes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Planning Fleet		A15			Aggregation of fleets used for planning modes, ports, cargo configurations, and prescheduled routes
2		Fleet Mode	fleetmode	MODE	Yes		Transport mode used by the planning fleet
3		Transport Agent		A15	Yes		Transportation agent or company identifier for this fleet
4		Planning Speed	nomspeed	1,999	Yes	nmi/hr	Nominal planning speed in nautical mph or knots for planning routes and target lift dates (this is a planning speed, not a scheduling or simulation speed, and should be set to match slower vehicles)
5		Planning Delay Hours	nomdelay	HoursDelay		hr	Nominal planning delay time in hours for each mode change to allow for vehicle repositioning, loading, unloading, and other delays for planning routes and target lift dates (accounts for repositioning in planning, not just load times)
6		Planning Ton-Hour Penalty	nompen	1,999	Yes	$/hr/ton	Nominal penalty per ton per hr for transport via this vehicle type for planning routes and target lift dates
7		Plan Fleet Productivity %		Float 0,100		% of C-mi/	Plan fleet useful planning percent allocation or productivity %, expressed as a percent of transport lift flow capacity (Mton-mi/day, SqFt-mi/day, etc.) as contributed by the first measure of each compartment
8		Utilization Rate %	vuterate	1,100		%	Vehicle effective utilization (UTE) rate expressed as a percent usage per day based on maintainability, logistics support, re-basing, non-productive use (applies to travel time only, not time in port, and cause recovery delays after trips)
9		Greedy Vehicle Wait	maxwaittime	HoursDelay		hr	Max wait time for evaluating additional cargo at the same POE after an assignment, used in the vehicle scheduling algorithm
10		Standard Depart Interval		Short>=1		day	Standard depart time interval for a prescheduled route, stored for reference only and not used to generate routes
11		Stop Arrival Tolerance	route_tolerance	DaysDelayToHr		day	Time window tolerance for early or late arrival at the prescheduled stops on this route
12		Route Delay Penalty	route_delay_penalty	Short>=0			Penalty for the delay of prescheduled stops when inserting new stops, the input value is the penalty of one day delay in cents, with increasing cost for greater delays
13		Remain On Route?	remain_on_route	Yesflag			Yes if the prescheduled ship should stay on its prescheduled route only up through the Route Last Day
14		Description		A50			Description of the prescheduled route
15			nextmodefleet	PLANFLT			Next fleet in list of fleets for a mode
16			firstplnfltcp	PLNFLTCP			First matching record in the table of capacities for this planning fleet
17			listflevent	PFLEVENT			List of capacity usage events for this fleet
18			listexfleet	EXCLUDE			List of exclusions for this planning fleet, if any
19			skip_planflt	Boolean			Planing fleet flag to skip evaluation used in mode planning
20			has_vehicle	Boolean			Flag that is true if the planning fleet has vehicles
21			predflevent	PFLEVENT			Pointer into the list of events to make list scans take less time
22			origin_depart_time	DayToHr			Estimated latest time that a vehicle from

Directory Type: Scenario

PLANFLT Planning Fleet	Edit Limits	Lists the fleet aggregations used for planning modes, ports, cargo configurations, and pre-scheduled routes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
							the current planning fleet can leave the origin last_hour when its mode isn't adjacent to the origin
23			planflt_start	DayToHr			The minimum start schedule time for all vehfleets for this planflt record

PLNFLTCP Plan Fleet Capacity	Edit Limits Output	Stores the allocated throughput capacity for each planning fleet for use in mode and port selection, as calculated from the percent allocation in PlanFlt

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Planning Fleet		PLANFLT			Planning fleet
2	Y	Compartment Measure	fleetcapmeasure	MEASURE			Unit of measure for the dynamic capacity constraint for this fleet
3		Allocated Fleet Capacity	fleetcapacity	Long>=0		Yes mton-mi/hr	Dynamic vehicle capacity allocated for the planning fleet, measured in compartment capacity times speed throughput units, such as mton-mi/hr, sqft-mi/hr, etc.
4			fleetsimremain	Long+/-			Fleet dynamic throughput capacity available for simulation, may go negative temporarily since trips are not interrupted in mid-route
5			fleetsimflag	Boolean			Fleet simulation flag used in the model

PLNFLTTR Plan Fleet Transfer	Edit Limits Keys Full	Specifies the allowable fleet to fleet transfers

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	From Planning Fleet		PLANFLT			The from planning fleet in a fleet to fleet transfer
2	Y	To Planning Fleet		PLANFLT			The to planning fleet in a fleet to fleet transfer
3		Allow Cargo Transfers?	allow_transfers	Yesflag			Marked Yes if the model should allow cargo transfers between the fleets

REJREAS Rejection Reason	Edit Limits Output	Lists cargos delayed and a count of candidate vehicle rejections by vehicle type

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Number	rejcrg	CARGO			Cargo number that is delayed or rejected
2	Y	Rejection Type		REJTYPE			Rejection reason type
3		Rejection Count	rejcount	Short>=0			Count of rejections for this cargo and rejection reason type

REQCLASS Requirement Class	Edit Limits	Lists the aggregated requirement classes for calculating summary cargo delivery versus required totals for reports

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Class		A15			Aggregated requirement class for calculating summary cargo delivery versus required totals for reports

REQFAC Req Facility Change	Edit Limits Output	Calculated table listing the facilities that a requirement improves

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement		REQUIRE			A requirement which modifies the facility capacity when deliverd
2	Y	Node	reqfacility	FACILITY			The target node whose facility capacity changes after complete delivery of the requirement
3	Y	Facility		FACILITY			The target facility whose capacity changes after complete delivery of the requirement
4			firstreqimprv	REQIMPRV			First pointer to the improvements associated with this requirement and facility

REQFLEET Required Fleet	Edit Limits	Defines the allowable fleets by mode for a requirement type, if the requirement type is restricted to certain fleets

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Type		REQTYPE			Requirement type which has restricted allowable fleets
2	Y	Transport Mode	reqfleetmode	MODE			Transport mode with restricted fleets
3	Y	Allowable Planning Fleet	reqfleet	PLANFLT			Allowable planning fleet for this requirement type and transport mode

Directory Type: Scenario

REQIMPRV Req Fac Cap Change	Edit Limits	Defines how the delivery of a requirement improves facility throughput

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement		REQUIRE			A requirement which modifies the facility capacity when deliverd
2	Y	Node		FACCAP			The target node whose facility capacity changes after complete delivery of the requirement
3	Y	Facility		FACCAP			The target facility whose capacity changes after complete delivery of the requirement
4	Y	Throughput Measure		FACCAP			A throughput measure whose capacity is changed after complete delivery of the requirement
5		Throughput Change	faccap_change	Long>=0			The amount of throughput change at this facility in the appropriate units of measure
6			faccap_change_meas	MEASURE			The throughput measure record in the MEASURE table

REQLAG Requirement Link Lag	Edit Limits	Defines timing links between delivery of independent and dependent requirements

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Dependent Req Id	dependent_req	REQUIRE			Dependent requirement identifier whose delivery must come after delivery of one or more independent requirements
2	Y	Independent Req Id	independent_req	REQUIRE			Independent requirement identifier whose delivery must come before delivery of one or more dependent requirements
3		Min Lag Days	reqminlag	DaysDelayToHr		day (hr)	Minimum lag time after the predecessor requirement is delivered before which the successor requirement should not be delivered
4		Target Lag Days	reqlag	DaysDelayToHr		day (hr)	Target lag time after the predecessor requirement is delivered before which the successor requirement should not be delivered

REQMISS Required Mission	Edit Limits	Lists special missions for requirements, cargo classes, and modes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		REQUIRE			Movement requirement having a special mission
2	Y	Cargo Class	reqmissclas	CARGCLAS			Cargo class to which the special mission applies (Dry, Pax, etc.)
3	Y	Mode	reqmissmode	MODE			Transport mode to which the special mission applies
4		Special Mission	reqmiss	MISSION	Yes		Special mission for this requirement, cargo class, and transport mode

REQMODE Required Mode	Edit Limits	Lists excluded modes for specific requirements and cargo classes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		REQUIRE			Movement requirement having a mode exclusion
2	Y	Cargo Class	reqmodeclas	CARGCLAS			Cargo class for which the mode exclusion applies
3	Y	Excluded Mode	reqmodeexcl	MODE			Excluded mode for this requirement and cargo class

REQNIMPR Req Node Cap Change	Edit Limits	Defines how the delivery of a requirement improves node throughput

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement		REQUIRE			A requirement which modifies the node capacity after arrival
2	Y	Node		NODECAP			The target node whose capacity changes after complete delivery of the associated requirement
3	Y	Throughput Measure		NODECAP			A throughput measure whose capacity is changed after complete delivery of the requirement
4		Throughput Change	nodecap_change	Long>=0			The amount of throughput change at this facility in the approriate units of measure
5			nodecap_change_meas	MEASURE			A throughput measure record in the MEASURE table

Directory Type: Scenario

REQNODE Required Node	Edit Limits	Lists required intermediate POE or POD nodes or ports for movement requirements with specified staging, POE/POD time frames, and mode of transport if desired

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		REQUIRE			Movement requirement identifier with intermediate ports or staging
2	Y	Cargo Class	reqnodeclas	CARGCLAS			Cargo class for which the required node applies
3	Y	LAD	reqlatetim	DayToHr		day (hr)	Latest arrival day at this required port node (the LAD is used to determine the order in which required nodes are visited)
4		EAD	reqearlytim	DayToHr		day (hr)	Earliest arrival day at this required port node, if any
5		Required Node	reqnode	NODE	Yes		Required intermediate POE/POD node or port for this movement requirement
6		Required Mode to Node	reqnodemode	MODE			Required transport mode specified for delivery to the intermediate node, if any (blank permits the use of any mode for delivery)
7		Required Config to Node	reqnodecfg	CARGCONF			Required configuration specified for delivery to the intermediate node, if any (blank permits the use of any configuration)
8		Stage Name	reqstage	STAGE			Staging deployment name if multiple requirements are staged together at this node (the STAGE record must have the same node as in REQNODE)
9		Description		A50			Description of this intermediate node, e.g. consolidation, container stuffing, mode change, re-configuration, combat loading, etc.

REQNOIM Req Node Improved	Edit Limits Output	Calculated list of requirements which improve node throughput

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement		REQUIRE			A requirement which modifies the node capacity when fully delivered
2	Y	Node	reqnode_improved	NODE			The target node whose capacity changes after complete delivery of the requirement
3			firstreqnoimpr	REQNIMPR			First pointer to the node improvements associated with this requirement

REQQUAN Requirement Quantity	Edit Limits	Provides quantity data for each movement requirement and cargo category

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		REQUIRE			Requirement identifier for the cargo
2	Y	Cargo Category	reqcatmeas	CATMEAS			Cargo category which describes the kind of cargo being transported
3	Y	Cargo Measure		CATMEAS			Dimensional measure for this requirement and cargo category
4		Quantity	reqqn	reqqn	Yes	Q	Requirement category quantity or dimension in this unit of measure
5			heapreqcat	REQQUAN			Heap sort order for this requirement quantity prior to mode planning

REQRET Requirement Return	Edit Limits	Lists requirement return or transfer days, if any, for removing requirements from a theater and eliminating its supply consumption and pax regeneration

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		REQUIRE			Requirement identifier that is returned or leaves the theater after delivery
2		Return Day	reqret	DayToHr		day (hr)	Requirement return day or departure day when it leaves the theater

REQTYPE Requirement Type	Edit Limits	Provides data about requirement types or unit types

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Type		A15			Requirement type or unit type
2		Requirement Class	reqclas	REQCLASS	Yes		Aggregated requirement class for calculating summary cargo delivery versus required totals for reports
3		Service	reqservice	SERVICE	Yes		Service for this requirement type or unit type
4		Planning Horizon Days	reqlook	DaysDelayToHr		day (hr)	Planning or look-ahead horizon in days for scheduling cargos of this requirement type prior to their target lift date
5		Assembly Delay Days	reqassdel	DaysDelayToHr		day (hr)	Additional assembly delay days needed after delivery at the destination used to calculate closure and lateness relative to the RDD
6		RLD Packaging Range		DayToHr		day (hr)	Packaging range for merging movements with similar Ready to Load Dates (RLDs)

Directory Type: Scenario

REQTYPE Requirement Type	Edit Limits	Provides data about requirement types or unit types

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
7		RDD Packaging Range		DayToHr		day (hr)	Packaging range for merging movements with similar Required Delivery Dates (RDDs)
8		RDD Tolerance	rddtol	DaysDelayToHr		day (hr)	Days tolerance for lateness at the destination relative to the RDD before mode planning increases delivery cost to reduce lateness
9		Max Days Late	maxlateness	DaysDelayToHr	Yes	day (hr)	Days late relative to the target delivery date beyond which a cargo is rejected in scheduling and is reported with rejection reasons, even if the penalty is acceptable
10		Cargo Lateness Penalty	reqlatepen	0,100		.01$/Q-day	Penalty for cargo ton-days of lateness (as compared with vehicle usage penalties) in the scheduling algorithm
11		Penalty/Benefit Cut-off	reqcutoff	Long>=1		$/$	Cost cut off level above which a potential cargo assignment is rejected early in the multi-port scheduling algorithm (blank or a large value means no cutoff)
12		Early Assignment Level	reqthresh	Short>=0		$/$	Threshold penalty/benefit level below which a potential cargo/ship assignment is accepted immediately in the multi-port scheduling algorithm (a large value reduces run time but may make a selection before costing a preferred vehicle)
13		Regeneration Delay Days	regendel	DaysDelayToHr		day (hr)	Nonzero delay days to regenerate attritted cargo for this requirement; cargo is regenerated with the same data as the original movement (blank means no regeneration)
14		Default Priority Order	reqtyporder	1,99			Default priority order for this requirement type if not specified for a given requirement (1 is the earliest priority order; blank is treated as no priority or as 99)
15		Minimum Cargo Load %	reqminld	%		%	Minimum % split of a single cargo (i.e. requirement+category) for assigning to a separate non-airlift trip (not used for airlift; 100% prevents any non-airlift splitting; this is separate from the Minimum Cargo Load % and Minimum Vehicle Load % in PARAM)
16		Integrity Benefit	integrity_benefit	DaysDelayToHr		day (hr)	Wait days benefit indicating a preference for loading identical Requirement Id's onto the same vehicle trip
17		Is Resupply?	is_resupply	Yesflag			Yes if this requirement type is dynamically ordered by other requirements in the theater, when dynamic resupply is being modeled
18			firstsuppcons	SUPPCONS			First consumption rate for this requirement type
19			listexreqtyp	EXCLUDE			List of exclusions for this requirement type, if any
20			firstreqfleet	REQFLEET			First allowable requirement fleet record for this requirement type

REQUIRE Requirement to Move	Edit Limits	Provides information about each movement requirement or package

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		A15			Movement requirement or package id
2		Major Unit	reqmajunit	MAJUNIT	Yes		Major unit associated with this movement requirement
3		Origin	reqorig	NODE	Yes		Starting origin of the requirement
4		Destination	reqdest	NODE	Yes		Final destination of the requirement
5		RLD	readytim	DayToHr		day (hr)	Ready to load day or earliest day the requirement is available at its origin
6		RDD	reqdeltim	DayToHr		day (hr)	Required delivery day of the packaged requirement at its destination including time for assembly
7		EDD	earlydel	DayToHr		day (hr)	Earliest allowed delivery day of the requirement at its destination prior to assembly
8		Computed Closure Day	close	DayToHr		day (hr)	Closure day for the requirement based on the closure minimum % requirement specified in the MajUnit table
9		Priority Order	reqpriority	1,99			Relative priority order for this requirement as a secondary sort after the Target Lift Date (one means first priority in assigning lift assets, blank defaults to the priority order of the requirement type)
10		Supply Requirement Id		SUPPREQ			Supply requirement identifier in the SUPPREQ table, when this requirement has been generated as either static or dynamic resupply
11			reqtotal	Long>=0			Total quantity for this requirement

Directory Type: Scenario

REQUIRE Requirement to Move	Edit Limits	Provides information about each movement requirement or package

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
12			listcrgclose	CARGO			Initially a list of requirement lag links with different predecessors for this successor; at the end, a list of terminal cargos arriving at the final destination sorted in order of end unload day for computing closure of the requirement
13			firstreqmode	REQMODE			First requirement excluded mode
14			firstreqmiss	REQMISS			First requirement special mission
15			firstreqquan	REQQUAN			First cargo for this requirement
16			firstreqlag	REQLAG			First successor requirement with a lag relative to this predecessor requirement
17			firstreqnode	REQNODE			First required node or port stop for this movement requirement
18			firstreqret	REQRET			First (and only) return day for this movement requirement
19			firstreqcat	REQCAT			First requirement category pair for this movement requirement
20			firstreqfac	REQFAC			First requirement facility improvement pair for this requirement
21			running_total	Long>=0		quantity	A running total of cargo quantities delivered for this requirement
22			listreqvflt	VEHFLEET			List of lift assets delivered with the requirement
23			firstreqnoim	REQNOIM			First requirement node impromvement pair for this requirement

ROUTE Route Distances	Edit Limits Output	Outputs a summary distance matrix calculated by the model and used during scheduling

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Route From Node	route_from_node	NODE	Yes		Begining node for the computed port-to-port route distance
2	Y	Route To Node	route_to_node	NODE	Yes		Ending node for the computed port-to-port route distance
3	Y	Route Type	route_type	ROUTTYPE	Yes		The type of route
4	Y	Vehicle Is Empty?	vehicle_is_empty	Yesflag			Yes if the route is computed using an empty vehicle (such routes are computed separately only if the vehicle has a payload that depends on critical leg)
5		Distance	route_distance	Short>=0		nmi	The route distance in nautical miles
6		Total Delay	route_delay	HoursDelay		hours	The additional route delay in hours, including the cumulative effects of individual link delays, refueling stops, link speed limits, and link speed changes
7		Critical Leg	route_critical_leg	Short>=0		nmi	The critical leg distance, which is the longest distance between refueling stops (including recovery legs if refueling is excluded at the POD), in nautical miles
8		Payload Percentage	route_payload	%		%	The percentage of the total cargo payload listed in VehData that is permitted associated on this route based on the critical leg distance
9		Attrit Daily Rate	route_attrition	Short>=0		%%/day	The effective overall attrition rates of the route, based on the probability convolution of the individual link attrition rates
10		Attrit Probability	route_probability	0,9999		%%	The cumulative probability of discrete attrition on this route based on the node attrition probabilities
11			route_convoy	CONVOY			Convoy record, if any, associated with this route
12			nextroute	ROUTE			Next pointer for lists of routes
13			firstroutecap	ROUTECAP			First pointer to a group of pointers to capacitated links for this route

ROUTEXCL Route Exclusion	Edit Limits	Lists excluded facility types for refueling on the various route types

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Route Type		ROUTTYPE			Route type for computing vehicle paths
2	Y	Excluded Refuel Fac Type	routfactypexcl	FACTYPE			Excluded facility type for refueling on the route type

ROUTLINK Route Links Used	Edit Limits Output	Lists the links used by routes in the RouteOut distance matrix

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Link From Node	route_link	NODELINK	Yes		From node for this transport link which is used by the routes listed in RouteOut
2	Y	Link To Node		NODELINK	Yes		To node for this transport link which is used by the routes listed in RouteOut
3	Y	Link Mode		NODELINK	Yes		Transport mode for this route link

Directory Type: Scenario

ROUTTYPE	Edit Limits	Provides route type data for determining vehicle paths, including refueling range, refueling facility requirements, and payload versus critical leg
Route Type		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Route Type		A15			Route type for computing vehicle paths
2		Transport Mode	rtmode	MODE	Yes		Transport mode for this route type
3		Speed to Convert Delays	rtspd	1,999	Yes	nmi/hr	Nominal routing speed which is used to convert link delays and refueling delays to equivalent distances for routing, in nautical mph
4		Range at Max Payload	rng	Short>=1		nmi	Range or critical leg distance corresponding to the maximum allowed payload, in nautical miles
5		Payload Decrease %/kmi	rngchg	0,999		%/1000nmi	Percent decrease in payload per 1000 nautical miles of increase in critical leg distance beyond the max payload range
6		Refuel Arrive/Depart Time	refuelarrdeptim	Hour		hr	Arrival and depart time delays for refueling (e.g., landing and takeoff delays)
7		Refuel Time	refueltim	HoursDelay		hr	Refueling time in the facility
8		Required Link Rating	rtlinkrating	0,9999			User-definable link rating required for each link in a feasible path for this route type; for example, for sealift the Required Link Rating may represent ship draft, which cannot exceed the Link Rating (link draft) of any link on a feasible path
9		Refuel Fac Length Req.	refuellen	Short>=0		ft	Facility length required for refueling
10		Refuel Fac Width Req.	refuelwid	0,999		ft	Facility width required for refueling
11		Refuel Fac Dimension Req.	refueldim	0,999		varies	Facility dimension required for refueling (e.g., draft for sea)
12		Refuel Fac Rating Req.	refuelrating	Short>=0		varies	Facility rating level required for refueling (e.g., LCN or landing classification number for air, boom capacity for sea)
13			firstroutexcl	ROUTEXCL			First facility type exclusion for refueling on this route type
14			emptrng	Short>=0			Max empty vehicle range calculated from the payload decrease down to zero payload
15			refueltottim	HoursDelay		hr	Total refuel time including arrive and depart time

RPTCARGO	Edit Limits	Lists multi-modal cargo movements from origin to destination based on predecessor/successor relationships
Cargo Link	Output	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Split Id		A50			Cargo split identifier for this report
2		Cargo Number		CARGO			Cargo or shipment number
3		Requirement Id		REQUIRE			Movement requirement or package id
4		Cargo Category		CARGOCAT			Cargo category which describes the kind of cargo being transported
5		Cargo Configuration		CARGCONF			Cargo configuration which is used to package the cargo for transport on one or more modes
6		Cargo Type		CARGTYPE			Mode-specific cargo type which groups cargo categories for a given transport mode in order to define stow factors, load rates, and load compatibility for vehicle compartments
7		Cargo Basic Quantity		reqqn		Q	Cargo quantity in the basic unit of measure for its cargo class (ston, pax, cbbl)
8		Begin Load Day		DayToHr		day	Day that the cargo begins loading (in the model, this is also the earliest possible load time based on RLD or predecessor cargo or earliest theater depart, until the cargo is simulated)
9		End Load Day		DayToHr		day	Day that the cargo completes loading
10		Begin Unload Day		DayToHr		day	Day that the cargo begins offloading (in the model, this is also the earliest possible unload time until the cargo is simulated)
11		End Unload Day		DayToHr		day	Day that the cargo completes offloading (in the model, this is also crgtdd, the Target Delivery Date until the cargo is scheduled)
12		Cargo Predecessor		CARGO			Unique predecessor cargo which immediately precedes this cargo and carries the same requirement (zero for an origin cargo)
13		Arrive POE		DayToHr		day	Day cargo arrives at POE
14		POE		FACILITY			POE node
15		POE Facility		FACILITY			POE facility name
16		Depart POE		DayToHr		day	Day cargo departs POE
17		Arrive POD		DayToHr		day	Day cargo arrives at POD
18		POD		FACILITY			POD node
19		POD Facility		FACILITY			POD facility name
20		Depart POD		DayToHr		day	Day cargo departs POD
21		Vehicle		VEHICLE			Vehicle assigned to this trip
22		Number of Vehicle Trips		Long>=0			Number of vehicle trips assigned to this trip

Directory Type: Scenario

RPTFACIL Report Facility	Edit Limits Output	Provides a report on facility cargo loading and offloading combining the Facility,Stop,Cargo,Trip tables

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Facility Node		FACILITY			Node with one or more facilities
2	Y	Facility Name		FACILITY			Facility name at this node
3	Y	Stop Number		STOP			Unique stop number for this port or node facility visit
4	Y	Cargo Number		CARGO			Cargo or shipment number
5		Facility Type		FACTYPE			Facility type for this facility (if blank, this facility can handle all transport modes for which no facility is defined)
6		Max Vehicles Per Hour		facvph		veh/hr	Maximum combined vehicle arrivals and departures per hour which can be handled in this facility during its hours of operation
7		Max Parking		Short>=0		veh	Maximum number of "standard" vehicles permitted in the facility at the same time, e.g. MOG for airlift or number of berths for sealift (vehicle types may weighted by an equivalence factor to convert to a standard vehicle)
8		Operating Hours/Day		0,24		hr/day	Operating hours per day that the facility is open
9		Arrive Day		DayToHr		day (hr)	Arrive day at the stop port
10		Depart Day		DayToHr		day (hr)	Depart day from the stop port
11		Is Unload?		Yesflag			"Yes" flag to indicate that a stop is for unloading, otherwise blank
12		Hours Wait for Facility		HoursDelay		hr	Hours vehicle spent waiting for port facilities
13		Trip Number		TRIP			First stop arrive day of the trip associated with this stop
14		Vehicle		VEHICLE			Aircraft assigned to this trip (flight) if airlift
15		Requirement Id		REQUIRE			Requirement identifier for this cargo
16		Cargo Category		CARGOCAT			Cargo category which describes the kind of cargo being transported
17		Cargo Type		CARGTYPE			Cargo type for this cargo
18		Cargo Basic Quantity		reqqn		Q	Cargo quantity in the basic unit of measure for its cargo class (ston, pax, cbbl)
19		Basic Quantity Measure		MEASURE			Cargo quantity basic measure (ston, pax, cbbl)
20		Begin Load or Unload Day		DayToHr		day (hr)	Day that the cargo begins loading or unloading at the stop
21		End Load or Unload Day		DayToHr		day (hr)	Day that the cargo ends loading or unloading at the stop
22		Cargo Predecessor		CARGO			Unique predecessor cargo which immediately precedes this cargo and carries the same requirement (zero for an origin cargo)

RPTFCAP Report Facility Cap	Edit Limits Output	Provides a summary of facility capacity status over time

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Facility Node	rptfcap	FACCAP			Node with one or more facilities
2	Y	Facility Name		FACCAP			Facility name at this node
3	Y	Facility Capacity Measure		FACCAP			Throughput measure for this facility (ston throughput, ston storage, etc.)
4	Y	Day	rptfcapday	simendday		day (hr)	Day at which a change in facility resources or capacity changes
5		Daily Capacity Available	rptfcapavl	Long>=0		Q	Daily total capacity available summed over all hours of operation for throughput, or ending capacity for storage
6		Daily Capacity Used	rptfcapused	Long>=0		Q	Daily total capacity utilized summed over all hours of operation for throughput, or ending stored capacity for storage
7		Hours at Saturation	rptfcapsat	0,24		hr	Number of hours in the day during which this facility capacity measure is saturated

RPTFVEH Report Facility Veh	Edit Limits Output	Provides a summary of facility vehicle throughput over time

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Facility Node	rptfvehfac	FACILITY			Node with one or more facilities
2	Y	Facility Name		FACILITY			Facility name at this node
3	Y	Facility Capacity Measure	rptfvehmeas	MEASCLAS			Vehicle throughput measure class for this facility (number of "standard" vehicle parking spaces, vehicles per hour, etc.)
4	Y	Day	rptfvehday	simendday		day (hr)	Day at which a change in facility resources or capacity changes
5		Max Available Capacity	rptfvehavail	Long>=0		Q	Daily total capacity available summed over all hours of operation
6		Utilized Capacity	rptfvehutil	Long>=0		Q	Daily total capacity utilized summed over all hours of operation
7		Hours at Saturation	rptfvehsat	0,24		hr	Number of hours in the day during which this facility is saturated, based on which capicity was limiting

Directory Type: Scenario

RPTLATE Report Lateness	Edit Limits Output	Summarizes delivery lateness for each theater and basic quantity measure

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Theater		THEATER			Theater name
2	Y	Basic Quantity Measure		BASMEAS			Basic quantity unit of measure (ston, pax, cbbl)
3	Y	Lateness Class		LATECLAS			Lateness classification for reporting summary lateness (e.g., Ontime, Scheduled, Unscheduled, Within 1 Day Late, etc.)
4		Total Quantity	totqn	Long>=0		Q	Total quantity for the theater, basic measure, and lateness classification
5		Total %	totpc	%		%	Total quantity percent for the theater, basic measure, and lateness classification

RPTMEAS Report Cargo Meas	Edit Limits	Lists the user-selected cargo quantity measures to be used in the RPTTOTAL and RPTTOTS cargo delivery reports, selected from RPTMEASU

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Report Measure	rptmeas	RPTMEASU			User-selected cargo quantity measures used for the RptMoe and RptTotal delivery profile reports
2		Select √		A1			Selection checkmark

RPTMEASU Report Cargo Measure Hide	Edit Limits	Lists the available cargo quantity measures for the RPTTOTAL and RPTTOTS cargo delivery reports, extracted from CATMEAS

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Report Measure		MEASURE			Available cargo quantity measures for the RptMoe and RptTotal delivery profile reports

RPTMOE Report MOE	Edit Limits Output	Stores the cumulative combat effectiveness MOE profile delivered over time for each theater and Major Unit

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Theater		THEATER			Theater
2	Y	Major Unit		MAJUNIT			Major unit
3	Y	Delivery Day		simendday		day	Delivery day
4		Cumulative MOE Required	cummoereq	Short>=0		moe	Cumulative MOE quantity required by this day based on the MOE rating for each major unit in the MAJUNIT table
5		Cumulative MOE Delivered	cummoedel	Short>=0		moe	Cumulative MOE quantity delivered by this day based on the MOE rating for each major unit in the MAJUNIT table

RPTMOES Report MOE Summary	Edit Limits Output	Stores the cumulative combat effectiveness MOE profile delivered over time for each theater summarized by Requirement Class

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Theater		THEATER			Theater
2	Y	Requirement Class		REQCLASS			Aggregated requirement class for computing summary MOEs
3	Y	Delivery Day		simendday		day	Delivery day
4		Cumulative MOE Required	cummoereqsum	Short>=0		moe	Cumulative MOE quantity required by this day based on the MOE rating for each major unit in the MAJUNIT table
5		Cumulative MOE Delivered	cummoedelsum	Short>=0		moe	Cumulative MOE quantity delivered by this day based on the MOE rating for each major unit in the MAJUNIT table

RPTREQ Report Requirement	Edit Limits Output	Provides calculated summary data for cargo requirement reports

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		REQUIRE			Movement requirement or package id
2	Y	Basic Quantity Measure		MEASURE			Basic unit of measure for reporting (ston, pax, cbbl)
3	Y	Cargo Number		CARGO			Cargo or shipment number or package id
4		Major Unit		MAJUNIT			Major unit associated with this movement requirement
5		Require Total Quantity		reqqn		Q	Summation of the total REQQUAN quantity field for each Requirement
6		Origin		NODE			Starting origin of the requirement
7		Destination		NODE			Final destination of the requirement
8		RLD		DayToHr		day	Ready to load day or earliest day the requirement is available at its origin
9		RDD		DayToHr		day	Required delivery day of the packaged requirement at its destination (may be adjusted from the original CINC RDD)
10		EDD		DayToHr		day	Earliest allowed delivery day of the requirement at its destination
11		Computed Closure Day		DayToHr		day	Closure day for the requirement based on the closure minimum % requirement specified

Directory Type: Scenario

RPTREQ Report Requirement	Edit Limits Output	Provides calculated summary data for cargo requirement reports

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
							in the REQTYPE table
12		Priority Order		1,99			Relative priority order for this requirement as a secondary sort after the Target Lift Date (one means first priority in assigning lift assets, blank defaults to the priority order of the requirement type)
13		Delay Days		DaysDelayToHr		day	Assembly delay days to assist in determining the Days Late when added to the Unload Day
14		Cargo Category		CARGOCAT			Cargo category which describes the kind of cargo being transported
15		Cargo Type		CARGTYPE			Cargo type for this cargo
16		Cargo Basic Quantity		reqqn		Q	Cargo quantity in the basic unit of measure for its cargo class (ston, pax, cbbl)
17		Cargo % of Requirement		%		%	Cargo quantity as a percent of the total requirement quantity for this basic measure
18		Begin Load Day		DayToHr		day	Day that the cargo begins loading (in the model, this is also crgtld, the Target Lift Day until the cargo is scheduled)
19		End Load Day		DayToHr		day	Day that the cargo completes loading
20		Begin Unload Day		DayToHr		day	Day that the cargo begins offloading
21		End Unload Day		DayToHr		day	Day that the cargo completes offloading (in the model, this is also crgtdd, the Target Delivery Date until the cargo is scheduled)
22		Is Attritted?		Yesflag			Yes if the cargo is attritted in the last run results, blank otherwise
23		Attrit Probability %%		0,9999		%%	Calculated cumulative probability of attrition (in %% or ten thousandths) for the cargo based on its route and schedule and including the attrition of predecessor cargos
24		Cargo Predecessor		CARGO			Unique predecessor cargo which immediately precedes this cargo and carries the same requirement (zero for an origin cargo)
25		Expected Quantity		reqqn		Q	Expected delivery quantity for display, computed as the cargo quantity times the attrition probability
26		Days Late		DaysDelayToHr		day	Days late for this cargo

RPTSTOP Report Stops	Edit Limits Output	Lists the vehicle stop itinerary

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Stop Number		STOP			Stop number
2		Vehicle Number		VEHICLE			Vehicle for this stop
3		Trip		TRIP			Trip for this stop
4		Trip Start Day		DayToHr		day	Trip start day (first arrive day), used for sorting

RPTSUPST Daily Supply Storage	Edit Limits Output	Reports the daily inventory levels at each supply storage site, as well as periodic order quantites

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Supply Category	rpt_supply_store	SUPSTORE			Supply cargo category which ordered and stored at a terminal by the dynamic resupply model
2	Y	Supply Node		SUPSTORE			Storage node or terminal where the supply cargo is inventoried
3	Y	Day	rpt_supply_day	simendday		day (hr)	Day on which the inventory has been tracked
4		Quantity On Hand	inventory	Long+/-		Q	Inventory level for this day
5		Quantity On Order	on_order	Long>=0		Q	Running total of the amount that has been ordered but not delivered as of this day
6		Order Daily Demand	demand_rate	Long>=0		Q/KCat/Day	Daily demand in effect on this day based on prior arrivals
7		Order Lead Time	lead_time	DayToHr		day (hr)	Estimated lead time used on this day
8		Quantity Ordered	quantity_ordered	Long>=0		Q	Basic quantity of resupply ordered on this day, if any
9		Order Number	order_number	Long>=0			Order number if a resupply order is placed on this day

RPTTOTAL Report Total Daily	Edit Limits Output	Stores the daily requirements delivery profile by Major Unit to the destination from the model results

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Theater		THEATER			Theater
2	Y	Major Unit		MAJUNIT			Major unit for this total delivery record
3	Y	Cargo Measure		RPTMEAS			Cargo quantity measure
4	Y	Delivery Day		simendday		day	Delivery day
5		Daily Quantity Required	dayqnreq	Long>=0		Q	Incremental quantity required on this day
6		Daily Quantity Delivered	dayqndel	Long>=0		Q	Incremental quantity delivered on this day
7		Cumulative Required	cumqnreq	Long>=0		Q	Cumulative quantity required by this day
8		Cumulative Delivered	cumqndel	Long>=0		Q	Cumulative quantity delivered by this day

Directory Type: Scenario

RPTTOTAL Report Total Daily	Edit Limits Output	Stores the daily requirements delivery profile by Major Unit to the destination from the model results

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
9		Daily % Required	dayperreq	%		%	Incremental % of total major unit quantity required on this day
10		Daily % Delivered	dayperdel	%		%	Incremental % of total major unit quantity delivered on this day
11		Cumulative % Required	cumperreq	%		%	Cumulative % of total major unit quantity required by this day
12		Cumulative % Delivered	cumperdel	%		%	Cumulative % of total major unit quantity delivered by this day

RPTTOTS Report Total Summary	Edit Limits Output	Stores the daily requirements delivery profile summarized by Requirement Class to the destination from the model results

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Theater		THEATER			Theater
2	Y	Requirement Class		REQCLASS			Aggregated requirement class for calculating summary cargo delivery versus required totals for reports
3	Y	Cargo Measure		RPTMEAS			Cargo quantity measure
4	Y	Delivery Day		simendday		day	Delivery day
5		Daily Quantity Required	dayqnreqsum	Long>=0		Q	Incremental quantity required on this day
6		Daily Quantity Delivered	dayqndelsum	Long>=0		Q	Incremental quantity delivered on this day
7		Cumulative Required	cumqnreqsum	Long>=0		Q	Cumulative quantity required by this day
8		Cumulative Delivered	cumqndelsum	Long>=0		Q	Cumulative quantity delivered by this day
9		Daily % Required	dayreqpersum	%		%	Incremental % of total major unit quantity required on this day
10		Daily % Delivered	daydelpersum	%		%	Incremental % of total major unit quantity delivered on this day
11		Cumulative % Required	cumreqpersum	%		%	Cumulative % of total major unit quantity required by this day
12		Cumulative % Delivered	cumdelpersum	%		%	Cumulative % of total major unit quantity delivered by this day

RPTVEH Report Vehicle Loads	Edit Limits Output	Provides vehicle itineraries with detailed cargo loads

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Number		VEHICLE			Aircraft sequential number
2	Y	Trip Number		TRIP			Trip number
3	Y	Stop Number		STOP			Unique stop number for this port or node facility visit
4	Y	Cargo Number		CARGO			Cargo or shipment number
5	Y	Compartment Type		CPTMEAS			Compartment type for the vehicle
6	Y	Compartment Measure		CPTMEAS			Compartment capacity unit of measure
7		Vehicle Type		VEHFLEET			Vehicle type
8		Vehicle Identifier		VEHFLEET			Vehicle identifier
9		Vehicle Fleet		VEHFLEET			Vehicle fleet
10		Is Unload?		Yesflag			"Yes" flag to indicate that a stop is for unloading, otherwise blank
11		Cargo Category		CARGOCAT			Cargo category which describes the kind of cargo being transported
12		Cargo Type		CARGTYPE			Cargo type for this cargo
13		Cargo Basic Quantity		reqqn		Q	Cargo quantity in the basic unit of measure for its cargo class (ston, pax, cbbl)
14		Cargo Basic Measure		BASMEAS			Cargo quantity basic measure (ston, pax, cbbl)
15		Begin Load or Unload Day		DayToHr		day (hr)	Day that the cargo begins loading or unloading at the stop
16		End Load or Unload Day		DayToHr		day (hr)	Day that the cargo ends loading or unloading at the stop
17		Compartment Capacity		Long>=0		mt,cbl,pax	Compartment stowage capacity in this unit of measure
18		Compartment % Load		0,150		%	Percent of compartment capacity loaded in the compartment measure
19		Compartment Load		Long+/-		C	Total quantity of cargo loaded in the compartment expressed in the compartment measure, accounting for stow factors (negative for offload stops for report sorting)

RPTVEHDY Report Vehicle Daily	Edit Limits Output	Provides a summary of vehicles in use by day

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Type		VEHTYPE			Vehicle type
2	Y	Day		simendday		day	Day of simulation
3		Transport Mode	vtranmode	MODE			Transport mode for this vehicle type
4		Total Vehicles	vtot	Short>=0			Total number of vehicles allocated for this vehicle type (in some cases the vehicles used may exceed this if simulation delays cause vehicles to extend their scheduled trips beyond the originally planned return day)

Directory Type: Scenario

RPTVEHDY	Edit Limits	Provides a summary of vehicles in use by day
Report Vehicle Daily	Output	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
5		Total Vehicles Used	vused	Short>=0			Number of vehicles in use, i.e. in transit or in port or in queue (sum of the next three fields)
6		Vehicles In Transit	vtransit	Short>=0			Number of vehicles in transit for this vehicle type
7		Vehicles In Port	vport	Short>=0			Number of vehicles loading or unloading in port for this vehicle type
8		Vehicles In Queue	vqueue	Short>=0			Number of vehicles in facility queues for this vehicle type
9		Vehicles In Slack	vslack	Short>=0			Number of vehicles carrying cargo but in waiting, e.g. for more cargo to be available or for the theater earliest depart day

RPTVTYPE	Edit Limits	Provides a summary of vehicle type utilization
Report Vehicle Type	Output	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Type		VCPTTYPE			Vehicle type
2	Y	Compartment Type		VCPTTYPE			Compartment type
3		Transport Mode	rptvehmode	MODE			Transport mode
4		Total Vehicles	rptvehtot	Short>=0			Total number of vehicles available for this vehicle type
5		Total Vehicles Used	rptvehused	Short>=0			Number of vehicles used for this vehicle type
6		Total Days Loaded	rptvehtim	Long>=0		days	Total vehicle-days of travel while carrying cargo, excluding empty legs
7		Total Travel Miles	rptvehdist	Long>=0		nmi	Total vehicle-miles traveled for this vehicle type while carrying cargo, excluding empty legs
8		Number of Trips	rptvehtrips	Long>=0			Total number of vehicle trips for this vehicle type
9		Avge Peak % Loaded	rptvehpkld	Long>=0		%	Average over all trips of the vehicle compartment peak % loaded (in each trip, the peak is over the trip and over all measures in the compartment, including the vehicle payload for the critical leg)

SERVICE	Edit Limits	Lists the U.S. military services
Service		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Service		A15			Name of the military service

STAGE	Edit Limits	Lists the staging deployments which have predecessor and successor requirements
Stage Location		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Stage Name		A15			Name given to the staging deployment
2		Stage Node	stagenode	NODE	Yes		Node or port at which staging occurs
3		Stage Latest Depart Day	stagelatedep	DayToHr		day (hr)	Lastest depart day for this staging after which requirements may proceed independently without visiting the staging node
4		Stage Earliest Depart Day	stageearlydep	DayToHr		day (hr)	Earliest depart day for this staging
5		Delay Hours at Node	reqdel	HoursDelay		hr	Delay hours at the intermediated node for consolidation, assembly, etc.
6			stagedep	DayToHr		day (hr)	Estimated target departure time from this staging node

STDSTOP	Edit Limits	Defines the stop sequence for standard prescheduled routes used in vehicle intialization; the stops repeat cyclically if the first node and facility match the last
Standard Stop		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Planning Fleet		PLANFLT			Standard prescheduled route identifier
2	Y	Stop Sequence		Short>=1			Stop sequence number for this prescheduled planning fleet (stops are assumed to repeat cyclically if the first and last stop have the same node and facility)
3		Arrive Day		DayToHr	Yes	day (hr)	Arrive day offset for this prescheduled stop sequence, starting from zero (the actual stop time is depends on the offset in VEHFLEET and the number of iterations
4		Node		FACILITY	Yes		Node associated with this prescheduled stop sequence number
5		Facility		FACILITY			Facility associated with this prescheduled stop sequence number
6		Depart Day		DayToHr	Yes	day (hr)	Depart day offset for this prescheduled stop sequence, starting from zero

Directory Type: Scenario

STOP	Edit Limits	Provides itinerary data for each node or port stop visit on each trip (voyage, flight, etc.)
Stop	Output	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Stop Number		Record# BigSt			Unique stop number for this port or node facility visit
2		Arrive Day	stparr	DayToHr	Yes	day (hr)	Arrive day at the stop port if a facility is available (the actual arrive day can be delayed further by facility constraints)
3		Node	stpfac	FACILITY	Yes		Node at which the stop is made
4		Facility Name		FACILITY			Port or node facility at which the stop is made, if node is an airport or seaport
5		Depart Day	stpdep	DayToHr	Yes	day (hr)	Depart day from the stop port
6		Is Unload?	isstpuld	Yesflag			Yes if a stop is for unloading, otherwise blank
7		Hours Wait for Facility	stpwaitfac	HoursDelay		hr	Hours vehicle spent waiting for port facilities and throughput capacity to arrive or depart
8		Trip Number	stptrip	TRIP			Trip number associated with this stop
9			listcrg	CARGO			List of cargos at the stop (>cargldy,>crgulddy)
10			nextstop	STOP			Next stop for the same trip in arrive day order
11			stpstatus	0,3			Stop status set to STOPNOTARRIVED, STOPARRIVED, or STOPDEPARTED depending on whether the stop has not yet arrived, has arrived, or has departed in simulation
12			stop_is_ammo	Boolean			True if the stop has ammunition cargo, otherwise False
13			stop_due	DayToHr			Time that a prescheduled stop is due when a vehicle has a Starting Route, set to the Last Simulation Day for other stops
14			stop_delay	Short+/-		hr	Delay to a stop arrival due to link congestion on the route used to arrive at the stop

STOP2	Edit Limits	Provides a shadow copy of the STOP table for form and report linkages
Shadow Stop	Output	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Stop Number		STOP			Unique stop number for this port or node facility visit
2		Arrive Day		DayToHr		day (hr)	Arrive day at the stop port
3		Node		FACILITY			Node at which the stop is made
4		Facility Name		FACILITY			Port or node facility at which the stop is made, if node is an airport or seaport
5		Depart Day		DayToHr		day (hr)	Depart day from the stop port
6		Is Unload?		Yesflag			"Yes" flag to indicate that a stop is for unloading, otherwise blank
7		Hours Wait for Facility		HoursDelay		hr	Hours vehicle spent waiting for port facilities
8		Trip Number		TRIP			First stop arrive day of the trip associated with this stop

STOWFACT	Edit Limits	Specifies the stow factor for each combination of compartment type and cargo type
Stow Factor	Keys Comput	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Compartment Type		CPTMEAS			Compartment type
2	Y	Compartment Measure		CPTMEAS			Compartment stowage measure
3	Y	Cargo Type		CARGTYPE			Cargo type for a specific transport mode
4		Stow Factor %	stowfact	StowFactor		Q/100C or	Stow efficiency in percent for loading the cargo type in the compartment type for this measure, including basic quantity conversion if the cargo measures don't match, expressed in % Q/C (i.e., cargo quantity stowed per 100 compartment capacity measure)
5			qnoffset	MEASURE			Offset for this cargo type (or its cargo category) relative to its first measure in order to match this compartment measure (normally ranges from 0 to NMEASURE-1; an offset of NMEASURE indicates no cargo measure matches the compartment measure)
6			stowfactpen	STOWPEN			STOWPEN record matching this stow factor

STOWPEN	Edit Limits	Lists combinations of compartment types and cargo types along with stow penalties
Stow Penalty	Keys Comput	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Compartment Type	stowcpttyp	CPTTYPE			Vehicle compartment type
2	Y	Cargo Type	stowcrgtyp	CARGTYPE			Cargo type with matching transport mode
3		Is Stow Excluded?	isnostow	Yesflag			Yes if this cargo type is excluded from stowage in this compartment type
4		Stow Penalty	stowpen	Short>=0		$/Q	Stow penalty per unit basic quantity of cargo for loading into this vehicle

Directory Type: Scenario

STOWPEN Stow Penalty	Edit Limits Keys Comput	Lists combinations of compartment types and cargo types along with stow penalties

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
5			nextstowpen	STOWPEN			compartment Next stow penalty record for this cargo type sorted in order of increasing stow penalty

SUPPCONS Supply Consumption	Edit Limits	Specifies standard daily consumption rates of resupply for consuming requirements

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Consuming Req Type		REQTYPE			Requirement type that consumes resupply in the theater
2	Y	Consumption Theater	supcons_theater	THEATER			Destination theater in which consumption occurs
3	Y	Consuming Cargo Category	supconscat	CARGOCAT			Consuming cargo category for estimating consumption
4	Y	Cargo Category Consumed	supcatcons	CARGOCAT			Supply cargo category that is stored at an inventory site
5		Supply Consumption Rate	supdemrate	0,999		Q/(1000Q)/	Daily consumption rate expressed as supply basic quantity per thousand basic quantity of the consuming category after arrival at its destination in the theater
6		Accompany Days of Supply	supaccomp	Byte>=0		Q/(1000Q)	Accompanying supply quantity in days of supply for this consuming requirement type

SUPPREQ Supply Requirements	Edit Limits	Lists the information needed to generate static and dynamic resupply requirements

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Supply Requirement ID		A15			Supply requirement identifier for static and dynamic resupply generation
2		Supply Source Node		NODE	Yes		Resupply origin node
3		Supply Category		SUPSTORE	Yes		Resupply cargo category
4		Supply Storage Node		SUPSTORE	Yes		Resupply storage node or terminal storage location
5		Supply Major Unit		MAJUNIT	Yes		Resupply major unit, which has a requirement type that is resupply
6		Supply Availability Date		DayToHr	Yes	day (hr)	Earliest time that resupply can be orderd from this requirement
7		Supply Delivery Time		DayToHr	Yes	day (hr)	Notional resupply delivery time or lead time, usually initially for generating static orders and recomputed for dynamic resupply
8		Priority Order		1,99			Scheduling priority order when generation movement requirements for resupply

SUPQUAN Supply Quantities	Edit Limits	Lists the units of measure and relative quantities as density information for generating resupply movements

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Supply Requirement ID		SUPPREQ			Supply requirement identifier matching a record in SUPPREQ
2	Y	Unit of Measure		MEASURE			Unit of measure for the resupply category
3		Quantity		Long>=0	Yes	Q	Relative quantity of resupply in the unit of measure, used to scale order quantites with consistent density ratios

SUPSTORE Supply Destination	Edit Limits	Provides data about resupply storage terminals in the theater

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Supply Cargo Category		CARGOCAT			Supply cargo category that is stored at an inventory site
2	Y	Supply Storage Node	supstorage_node	NODE			Resupply storage node or terminal storage location
3		Prepositioned Stock	supstorestock	reqqn		Q	Quantity of reserved stock prepositioned at this supply storage node
4		Stock Safety Level	supreorder	reqqn		Q	Minimum safe stockpile level, which is used to reordered supply when the inventory level is projected to fall below this level at the current estimated lead time and consumption rate
5		Stock Order To Level	suporderto	reqqn		Q	Target stockpile level to reorder to when orders are placed
6		Min Order Quantity	supminorder	Long>=1	Yes	Q	Minimum order quantity for this supply category in this theater
8			supleadtim	DayToHr		day (hr)	Estimated supply lead time based on the best supplier
9			sup_demand	Long>=0			Demand for estimating inventory position in reorder calculations
10			sup_onhand	Long+/-		Q	Amount of inventory on hand, can be negative for back order warnings

Directory Type: Scenario

SUPSTORE Supply Destination	Edit Limits	Provides data about resupply storage terminals in the theater

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
11			sup_intransit	Long>=0			Total basic quantity in transit
12			listsupstorecargo	CARGO			List of representative cargos for this suppstore

THEATER Theater	Edit Limits	Provides data about the theaters

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Theater		A15			Theater name
2		Mobilization M Day		DayToHr		day	Theater M day or begin mobilization day relative to global day 0
3		Deployment C Day		DayToHr		day	Theater C day or commence deployment day relative to global day 0
4		Combat D Day		DayToHr		day	Theater D day on which casualties and attrition begin, relative to global day 0
5		Earliest Depart Day	earlydep	DayToHr		day (hr)	Earliest day that a vehicle can leave after exiting the POE facility before traveling towards this theater (cargo can be preloaded and the facility exited)
6		Start Planning Day	thtrbegplan	DayToHr		day (hr)	Day on which requirements can first start being considered for scheduling to this theater
7			listexthtr	EXCLUDE			List of exclusions for this theater, if any

THTRREQ Theater Require Type	Edit Limits Keys Full	Provides data about passenger weights by theater and requirement type

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Theater		THEATER			Theater name
2	Y	Requirement Type		REQTYPE			Requirement or unit type
3		Pax Weight	thtrpaxwt	1,999	Yes	lbs/Pax	Weight in pounds of each passenger and his carry-on gear for vehicle payload/weight calculations (does not affect facility throughput)
4		Accompanying Gear	thtracmpywt	Short>=0		lbs/Pax	Weight in pounds of non-carry-on accompanying gear per passenger for both facility throughput and vehicle payload calculations
5			thtreq_total	Long>=0		basic unit	Total quantity required for this theater and requirement type, accumulated as of the current simulation time plus planning horizon
6			thtreq_delivered	Long>=0		basic unit	Cumulative delivered for this theater and requirement type, as of the current simulation time
7			thtreq_estimated	Long>=0		basic unit	Cumulative estimaged quantity of scheduled cargo for this theater and requirement type, forecasted into the future as of the Planning Horizon

TIMEVARY Time Variation	Edit Limits	Specifies data which changes over time (derived from user inputs in the associated data tables, should not be edited directly)

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Change Day	tvtim	0,999		day	Day on which change occurs (not DayToHr domain, leave as days)
2	Y	Table to Vary		VARYPARD			Table name which has a datatype that changes over time
3	Y	Field to Vary		VARYPARD			Nonkey descriptive datatype which changes over time
4	Y	Key Field Values		A100			Key field value(s) stored as a single text string using · as a field delimiter
5		New Value	tvvalue	Long+/-	Yes	varies	New numeric value of the datatype which takes effect on the change day (for Yes flag fields, the new value is stored as 1 for Yes, otherwise blank or 0)
6		Computed Model Datatype	tvdattyp	A20MODDAT	|Ye		Computed model datatype name for the changed data
7		Computed Record Number	tvrecnum	Short>=0	|Ye		Computed record number of the changed record

TRIP Trip	Edit Limits Output	Lists the trips (voyages, flights, etc.) and the assigned vehicles

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Trip Number		Record# BigSt			Trip number
2		Vehicle	tripvehicle	VEHICLE			Vehicle assigned to this trip
3		Convoy Trip Number	tripcnvy	CONVTRIP			Convoy trip number this voyage is assigned to, if any (if a trip has multiple convoys between different stops, only the last convoy trip is stored here)

Directory Type: Scenario

TRIP Trip	Edit Limits Output	Lists the trips (voyages, flights, etc.) and the assigned vehicles

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
4		Number of Vehicle Trips	tripnumveh	Long>=0			Number of vehicle trips assigned to this trip
5			nexttrip	TRIP			Next trip (voyage, flight, etc.) for the same vehicle
6			liststop	STOP			List of stops in this trip sorted by arrive day
7			curstp	STOP			Current simulate stop of the trip, either in process or most recently completed (0 if the trip has not yet begun simulation at all)
8			curcrg	CARGO			Current cargo ready for loading/unloading at the current simulation stop of the trip (0 if all cargos at the curstop are completed but the next stop cannot be started yet because the vehicle is exiting or in transit)
9			curedep	DayToHr		day (hr)	Current largest early depart time over all cargos at the stop currently being simulated (used for special missions or theater earliest depart and may delay the ship departure after all cargo is loaded and the facility is departed)
10			curqn	Long>=0		Q	Current quantity remaining for loading or unloading the current cargo
11			curtriptime	Long>=0		day (hr*10	Arrive time for simulation of the current or next stop of this trip, used for sorting the trip heap; now multiplied by 10000 and added to original stop arrive time to maintain original schedule order
12			heaptrip	TRIP			Priority queue of trips heap-sorted in order of the arrive day of the trip current simulation stop (the end of the heap is also used to store unfinished trips simulated on the current day prior to putting them back on the heap)
13			curfac	FACILITY			Current facility for the current simulation stop
14			nextcnvytrip	TRIP			Next trip in the current convoy buildup being prepared for scheduling

VARYPAR Vary Parameter	Edit Limits Display Onl	Specifies data elements to be varied parametrically

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Table to Vary		VARYPARD			Table with parameter to vary
2	Y	Field to Vary		VARYPARD			Parameter to vary
3	Y	Key Field Values		A100			Key field value(s) stored as a single text string using · as a field delimiter
4		Start Value	vpstartval	Long>=0	Yes		Starting value for the parameter variation (Yes/blank values input as 1/0)
5		Increment	vpinc	Short>=1	Yes		Incremental value for the parameter variation
6		Number of runs	vpnumruns	1,99	Yes		Number of runs for the parameter variation
7		Computed Model Datatype	vpdattyp	A20MODDAT	|Ye		Computed model datatype name for data to be varied parametrically
8		Computed Record Number	vprecnum	Short>=0	|Ye		Computed record number to be varied parametrically

VARYRUN Vary Output Run	Edit Limits Output	Stores saved values from a sensitivity run

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Run	runnum	Record# VehCp			Sequential run number
2	Y	Table	runsave	VARYSAVE			Table with the nominal value
3	Y	Field		VARYSAVE			Name of the parameter
4	Y	Key Field Values		VARYSAVE			Key field value(s) stored as a single text string using · as a field delimiter
5		Field Value	runval	Long>=0			Value of the saved parameter

VARYSAVE Vary Save Data	Edit Limits	Defines data to be saved across multiple runs when data elements have parameter variations or sampling distributions

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Table to Save		VARYSTAT			Table name which has data to be saved over multiple sensitivity runs
2	Y	Field to Save		VARYSTAT			Nonkey data element which is to be saved over multiple sensitivity runs
3	Y	Key Field Values		A100			Key field value(s) stored as a single text string using · as a field delimiter
4		Computed Model Datatype	savedattyp	A20MODDAT	|Ye		Computed model datatype number for sampled data
5		Computed Record Number	saverec	Short>=0	|Ye		Computed record number of the sampled data

Directory Type: Scenario

VARYSTAT	Edit Limits	Lists tables and data elements which are sampled from a stochastic distribution taking as mean the database value
Vary Sampled Data		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Table to Sample		VARYPARD			Table name which has a datatype sampled from a stochastic or parametric distribution
2	Y	Field to Sample		VARYPARD			Nonkey descriptive datatype which has a sampling distribution
3		Distribution Type	vsdistyp	VARYDIST	Yes	varies	Sampling distribution type for the data (positive values only)
4		Distribution Parameter	vdistpar	Long>=0			Distribution parameter which defines the sampling distribution together with the mean or median as derived from the database value
5		Number of Runs	vdistrun	1,100	Yes		Number of runs for this stochastic datatype
6		Computed Model Datatype	vstatdattyp	A20MODDAT	Ye		Computed model datatype name for sampled data

VCPTTYPE	Edit Limits	Lists the compartments available for each vehicle type
Veh Cpt Type		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Type		VEHTYPE			Vehicle Type (e.g. C-5 for air; Breakbulk for sea; Van, Flatbed, Special, Refrigerated, etc. for motor; Flatcar for Rail)
2	Y	Compartment Type	cpttyp	CPTTYPE			Name of an available compartment type for the vehicle type

VEHCAP	Edit Limits	Defines load capacities for each vehicle identifier, compartment, and unit of measure
Vehicle Capacity	Keys Comput	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Type		VEHDATA			Vehicle type
2	Y	Vehicle Identifier		VEHDATA			Vehicle identifier for this vehicle data
3	Y	Compartment Type		CPTMEAS			Compartment type for this vehicle type
4	Y	Compartment Measure		CPTMEAS			Compartment stowage measure
5		Capacity	vcptcap	VehCap	Yes	mt,cbl,pax	Stowage capacity allowed for this vehicle compartment and measure
6			vcpttype	VCPTTYPE			Vehicle and compartment type matching this capacity record

VEHDATA	Edit Limits	Provides detailed characteristics about each kind of vehicle identified in the system
Vehicle Data		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Type	vtype	VEHTYPE			Vehicle type name
2	Y	Vehicle Identifier		A25			Vehicle identifier for this vehicle data
3		Cruising Speed	vspeed	1,999	Yes	nmi/hr	Cruising speed of this vehicle, in nautical mph
4		Max Cargo Load	vmaxld	VehMaxLd	Yes	ston	Maximum allowed cargo load over all compartments for this vehicle, in ston
5		Facility Length Required	vfaclen	Short>=0		ft	Facility length required for loading and unloading
6		Facility Width Required	vfacwid	0,999		ft	Facility width required for loading and unloading
7		Facility Dimension Req.	vfacdim	0,999		varies	Facility dimension required (e.g., draft for sea) for loading and unloading
8		Facility Rating Required	vfacrating	Short>=0		varies	User-definable facility rating required for loading and unloading (e.g., landing classification number for air, boom capacity for sea)
9			firstvehcap	VEHCAP			First vehicle compartment capacity for this vehicle identifier
10			firstvehfleet	VEHFLEET			First vehicle availability record for this vehicle identifier

VEHFLEET	Edit Limits	Lists the availability of vehicles by starting location or route, starting time for scheduling, and number of vehicles
Vehicle Fleet		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Type	vehdata	VEHDATA			Vehicle type
2	Y	Vehicle Identifier		VEHDATA			Vehicle identifier for this starting location
3	Y	Vehicle Fleet	flt	FLEET	Yes		Fleet identifier for this starting location
4		Number of Vehicles	numveh	Short>=0			Number of vehicles in the fleet for this vehicle type
5		Start Scheduling Day	start_schedule	DayToHr		day (hr)	Administrative day that this fleet and vehicle type are first available for scheduling new trips, stops, and cargo
6		Stop Scheduling Day	fltret	DayToHr		day (hr)	Stop day after which this fleet and vehicle type are returned to its starting node or route with no more use (blank or 0 is treated as available through the simulation

Directory Type: Scenario

VEHFLEET Vehicle Fleet	Edit Limits	Lists the availability of vehicles by starting location or route, starting time for scheduling, and number of vehicles

#	K?	Field Name	Model Datatype	Domain	Lookup	B|V	Unit Meas	Description
								end date)
7		Start Node	startfac	FACILITY				Starting home base node for this fleet and vehicle type (a vehicle starts at and returns to its home base if not otherwise assigned)
8		Start Facility		FACILITY				Starting home base facility for this fleet and vehicle type (a vehicle starts at and returns to its home base if not otherwise assigned)
9		Start Route Offset		-99,999			day	Offset day for this fleet and vehicle for a standard prescheduled starting route cycle
10		Start Route Last Day	last_presched_day	DayToHr			day	Last day beyond which the prescheduled starting route is no longer cycled
11		Special Mission	fltmiss	MISSION				Special mission which restricts this fleet to matching special mission movement requirements for a designated period of time
12		New Vehicle Penalty	newvehpen	Short>=0			$/new veh	Penalty for the first use of a new vehicle of this type and fleet
13		Call Sign		A15				International call sign or identifier of the vehicle and fleet
14		Other Identifier		A15				Other identifier such as NISC (Naval Intelligence Security Code) for the vehicle and fleet
15		Requirement	vehfleet_require	REQUIRE				Requirement by which this vehicle fleet is delivered (these vehicles are not available until the requirement is completely delivered)
16			firstvehicle	VEHICLE				Lookup into the vehicle table
17			fltlaststp	STOP				Fleet last stop for the current day for the aggregated vehicle flow scheduling algorithm
18			fltusetime	HoursDelay				Fleet usage time in the Vehicle Flow scheduling algorithm
19			cndpoefac	FACILITY				Candidate POE facility for this vehicle fleet assignment
20			cndpodfac	FACILITY				Candidate POD facility for this vehicle fleet assignment
21			cndcritleg	Short>=0				Critical leg from POE to POD for this vehicle fleet candidate assignment
22			nextreqvflt	VEHFLEET				Next pointer to list of lift assets delivered with a requirement
23			startday	DayToHr			day	Physical start day that this vehicle and fleet can first appear in the plan
24			vehfleet_load	Long>=0			basic meas	Quantity carried by a vehicle fleet in mode planning
25			load_is_current	Boolean				Flag that the vehfleet load value is current

VEHICLE Vehicle	Edit Limits Output	Tracks status and location of each unique vehicle

#	K?	Field Name	Model Datatype	Domain	Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Number		Record# Vehic				Vehicle unique sequential number
2		Vehicle Type	vehflt	VEHFLEET		Yes		Vehicle type
3		Vehicle Identifier		VEHFLEET				Vehicle identifier
4		Vehicle Fleet		VEHFLEET				Vehicle fleet for this vehicle
5		Attrit or Damage Day	vehattr	DayToHr			day (hr)	Last attrit or breakdown day for this vehicle, if any
6		Replace or Repair Day	vehrep	DayToHr			day (hr)	Last replacement or repair day for this vehcile, if any
7		Computed Course	vcourse	Degree			Deg	Current course direction computed for the current date and time
8		Computed Latitude	vlat	Lat			deg min H	Current latitude computed for the current date and time
9		Computed Longitude	vlon	Lon			deg min H	Current longitude computed for the current date and time
10			listtrip	TRIP				List of trips for this vehicle
11			insbegstp	STOP				Earliest insertion stop at the end of a trip after which cargo insertion into a vehicle route can begin

VEHTYPE Vehicle Type	Edit Limits	Lists vehicle types by transport mode

#	K?	Field Name	Model Datatype	Domain	Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Type		A15				Vehicle type name, e.g. Breakbulk for sealift, C-17 for airlift, etc.
2		Route Type	vrouttype	ROUTTYPE		Yes		Route type to use for this vehicle type
3		Arrive/Depart Time	varrdeptim	Hour			hr	Combined total additional time for node arrival and departure for this vehicle type, such as takeoff/landing time or port maneuver time (adds to travel time and

Directory Type: Scenario

VEHTYPE Vehicle Type	Edit Limits	Lists vehicle types by transport mode

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
							reduces the average block speed, but does occur not affect facility parking)
4		Vehicle Standard Size %	vehsizepc	0,9999	Yes	%	Size of vehicle relative to "standard" vehicle size, may exceed 100% for larger vehicles, used for allocating facility berths or parking spaces (MOG)
5		Time Penalty	vtimpen	0,999	Yes	$/hr	Penalty for vehicle usage per hour, used to compare with cargo lateness in the scheduling algorithm
6		Greedy Vehicle Level	vokcbr	Short>=0	Yes	$/$	Limit on the acceptable cost/benefit ratio for a greedy vehicle trying to get additional cargo immediately after an assignment
7		Link Attrit Multiplier %	vlinkattrmult	%		%	Attrition adjustment multiplier applied to the link attrition or breakdown rate for this vehicle type while in transit (blank or 0 is treated as 100%)
8		Node Attrit Multiplier %	vnodeattrmult	%		%	Attrition adjustment multiplier applied to the node attrition or breakdown rate for this vehicle type while at the node (blank or 0 is treated as 100%)
9		Attrit Partial Damage %	vattrpart	%		%	Percent of attritted or broken down vehicles which are partially damaged and can be repaired
10		Repair Days	vrepair	DaysDelayToHr		day (hr)	Delay days for repair of a partially damaged vehicle, after which the vehicle continues its scheduled itinerary
11		Replace Days	vreplace	DaysDelayToHr		day (hr)	Nonzero vehicle replacement time at the initial ALD node after total attrition (if blank, no replacement occurs)
12			firstvcpttyp	VCPTTYPE			First vehicle compartment type for this vehicle type
13			firstvfactyp	VFACTYPE			First facility type for this vehicle type
14			listexvehtyp	EXCLUDE			List of exclusions for this vehicle type, if any
15			firstvehdata	VEHDATA			First vehicle data record matching this vehicle type, if any
16			nextvehtype	VEHTYPE			Next vehicle type for the same mode
17			vmode	MODE			Transport mode of this vehicle type

VFACDIM Veh Fac Dimen Limit	Edit Limits	Sets cargo dimension limits for loading onto vehicle types at facility types

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Type		VFACTYPE			Vehicle type with cargo dimension constraint
2	Y	Facility Type		VFACTYPE			Matching facility type with cargo dimension constraint
3	Y	Max Dimension Measure	vfacmeas	MEASURE			Cargo dimension constraint measure (Item Height Ft, Item Weight Ston, etc.)
4		Max Cargo Dimension	vfacmaxdim	Long>=0		ft,ston	Cargo dimension limit to exclude cargo that is too big from loading on this vehicle type at this facility type

VFACTYPE Veh Facility Type	Edit Limits Keys Comput	Lists matchings of vehicle types and facility types for loading/unloading cargo

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Type		VEHTYPE			Vehicle type
2	Y	Facility Type	vfactyp	FACTYPE			Facility type with matching mode
3		Is Vehicle Excluded?	isvfacexcl	Yesflag			Yes if the vehicle type is excluded from loading and unloading cargo at this facility type, blank otherwise (vehicle may still refuel unless prevented by Is Refuel Excluded? field)
4		Setup Delay	vfacsetupdel	HoursDelay		hr	Fixed setup or entrance delay time for this vehicle type while occupying this facility type (the vehicle takes parking space and the facility must be open during setup; setup delays vehicle and cargo loading/unloading)
5		Shutdown Delay	vfacshutdndel	HoursDelay		hr	Fixed shutdown or exit time for this vehicle type while occupying this facility type (the vehicle takes parking space and the facility must be open during shutdown; shutdown delays vehicle but not cargo loading or unloading)
6		Facility Visit Penalty	vfacpen	Short>=0		$/visit	Penalty for multi-facility visits on a single trip, used in the scheduling algorithm (the first POE and POD facilities on a new trip are not penalized)
7			firstloadrate	LOADRATE			First load rate for this vehicle type and facility type

Directory Type: Scenario

VFACTYPE Veh Facility Type	Edit Limits Keys Comput	Lists matchings of vehicle types and facility types for loading/unloading cargo

#	K?	Field Name	Model Datatype	Domain	Lookup	B	V	Unit Meas	Description
8			firstvfacdim	VFACDIM					First vehicle type/facility type dimension limit in VFACDIM

Directory Type: System

DIRLIST Directory Listing	Edit Limits Update	Lists the available user databases in the system

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Directory Type		DIRTYPE			The name of the directory type
2	Y	Subdirectory		A8			An existing 8-character subdirectory name for this directory type (multiple subdirectories may exist some directory types, but all lookups must refer only to the same subdirectory or to the Refer subdirectory)
3		Classification		CLASSIF			Classification if any for this directory
4		Remarks		A255			Remark or comment for this directory

MAPDIR Map Data Directories	Edit Limits Hide	Lists the valid mapping directories computed by the system

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Name		A25			Name of a database directory (could be: "dirlist->subdir+(dirtype)")
2		Path		A255	Yes		The full path of the directory where the mapping files reside
3		Comments		A255			Additional information about this directory (from dirlist comments)

PCEXPORT PC Export Table	Edit Limits Display Onl	Lists the table being exported in PC Export and provides a shell for actions on the exported data updates

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Export Table		TABLE			Table currently being exported

PROBLEM Data Problems	Edit Limits Output	Lists problems, errors, and warnings accumulated by the data checks

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Directory		A40			Directory of the table which has a data problem
2	Y	Table		A8			Table name which has a data problem
3	Y	Record		Long>=0			Record number which has a data problem
4	Y	Field		A25			Field name which has a data problem
5	Y	Description		A150			Description of the data problem

Directory Type: Tpfdd

ACRGTYPE Edit Limits JOPES Air Cargo Type Update	Lists the JOPES air cargo types (Bulk, Oversize, etc.) and their maximum dimensions

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Air Cargo Type Label		A3			Air cargo type label for the second position of the cargo category code
2		Air Cargo Type		A10			JOPES air cargo type such as Bulk, Oversize, etc.
3		Max Length Inches		Short>=1	Yes	In	Maximum length in inches for this air cargo type
4		Max Width Inches		Short>=1	Yes	In	Maximum width in inches for this air cargo type
5		Max Height Inches		Short>=1	Yes	In	Maximum height in inches for this air cargo type
6		Description		A100			Air cargo type description

AGGCAT Edit Limits Aggr Cargo Category	Provides translations for aggregating cargo category

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Category		A15			Cargo category which describes the kind of cargo being transported
2		Cargo Category Name		A15	Yes		Short cargo category name for use in GDAS
3		Cargo Category Code		CCC			JOPES three-character cargo category code describing cargo characteristics
4		Cargo Category Code 4		CCC4			Customized cargo category code 4 or JOPES heavy lift and dimension code
5		Heavy Lift Code		HEAVLIFT			JOPES heavy lift code for standard cargo category
6		Max Length Inches		Short>=1		In	Maximum length in inches for this cargo category based on matching Air Cargo Type in ACRGTYPE, Cargo Category Position 3 in CCC3, and Cargo Category Position 4 in CCC4
7		Max Width Inches		Short>=1		In	Maximum width in inches for this cargo category based on matching Air Cargo Type in ACRGTYPE, Cargo Category Position 3 in CCC3, and Cargo Category Position 4 in CCC4
8		Max Height Inches		Short>=1		In	Maximum height in inches for this cargo category based on matching Air Cargo Type in ACRGTYPE, Cargo Category Position 3 in CCC3, and Cargo Category Position 4 in CCC4
9		Max Weight Ston		Short>=1		Ston	Maximum weight in short tons for this cargo category based on matching Air Cargo Type in ACRGTYPE, Cargo Category Position 3 in CCC3, and Cargo Category Position 4 in CCC4
10		Major Category Label		MAJCAT			Major cargo category label corresponding to the first position of the JOPES cargo category code
11		Air Cargo Type Label		ACRGTYPE			Air cargo type label for this second position cargo category code
12		Unit Class Label		UNITCLAS			Unit equipment classification short label (Ue,Ac,Nu) for the second position of the cargo category code
13		Containerizability Label		CNTRTYPE			Containerizability type corresponding to the third position of the cargo category code
14		Cargo Category Code 1		CCC1			First position of the JOPES cargo category defining the kind of cargo
15		Cargo Category Code 2		CCC2			Second position of the JOPES cargo category defining the air cargo type and the unit class
16		Cargo Category Code 3		CCC3			Third position of the JOPES cargo category defining cargo containerizability
17		Description		A100			Unit level code description
18		Aggregated Cargo Category		A15			Aggregated cargo category for exporting to a scenario database

AGGMAJUN Edit Limits Aggr Major Unit	Provides translations for aggregating major unit

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Major Unit		A20			Major unit name for analysis of requirement closures and measures of effectiveness
2		Unit Type Code		A5TUUTC			Matching unit type code for this major unit
3		Unit Type Function		UTCFUNCT			Unit type code first position which represents the functional area of the unit
4		Unit Level Code		ULC			Unit level code which categorizes the type of unit according to stratum, echelon, or control concentration
5		Deployment Indicator Code		DEPLOYIC			JOPES deployment indicator code which characterizes deployability
6		Service Code		ORGCODE			JOPES service code or organization
7		Unit Type Short Name		A15			Unit type short name
8		Unit Type Name		A55			Unit type name
9		Non Unit Move Type Code		NUMOVETP			Non-unit type movement code
10		Using Organization		ORGCODE			Non-unit using organization for a non-unit movement

Directory Type: Tpfdd

AGGMAJUN Edit Limits Aggr Major Unit	Provides translations for aggregating major unit

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
11		Supply Class Code		SUPCLAS1			Non-unit JOPES supply class major code which categorizes the kind of cargo
12		Aggregated Major Unit		A20			Aggregated major unit for export to a scenario database
13		Aggregated RLD Interval		Short>=0		day	Aggregate RLD interval for aggregating the day, for example 5 means every 5 days
14		Aggregated RDD Interval		Short>=0		day	Aggregate RDD interval for aggregating the day, for example 5 means every 5 days
15		Aggregated EDD Interval		Short>=0		day	Aggregate EDD interval for aggregating the day, for example 5 means every 5 days
16		Aggregated LAD Interval		Short>=0		day	Aggregate LAD interval for aggregating the day, for example 5 means every 5 days
17		Aggregated RLD Offset		Short>=0		day	Aggregate RLD offset within the aggregation interval, for example 2 means the assigned day is 2 plus the start of the interval
18		Aggregated RDD Offset		Short>=0		day	Aggregate RDD offset within the aggregation interval, for example 2 means the assigned day is 2 plus the start of the interval
19		Aggregated EDD Offset		Short>=0		day	Aggregate EDD offset within the aggregation interval, for example 2 means the assigned day is 2 plus the start of the interval
20		Aggregated LAD Offset		Short>=0		day	Aggregate LAD offset within the aggregation interval, for example 2 means the assigned day is 2 plus the start of the interval
21		Keep Req Id Unique?		Yesflag			Yes if unique Requirement Id is to be maintained during aggregation, blank if requirements can be aggregated when all data elements match and quantites can be totaled by category

AGGMODE Edit Limits Aggr Required Mode	Provides translations for aggregating required transport mode

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Required Mode		A15			Required transport mode
2		Transport Mode Code		MODE_SRC			Transport mode code
3		Transport Source Code		MODE_SRC			Transportation source providing organization code
4		Aggregated Required Mode		A15			Aggregated mode for export to a scenario database
5		Description		A100			Unit level code description

AGGNODE Edit Limits Aggr Node	Provides translations for aggregating node location

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Node	aggnode	A15			Detailed node representing an origin, destination, POE, POD, POI, etc.
2		Geolocation Name		A17	Yes		Geolocation name
3		Installation Type Code		INSTTYPE	Yes		JOPES geolocation installation type code
4		Country State Code		CNTRYST	Yes		JOPES country/state code
5		Country State Short Name		A5	Yes		JOPES country/state short name
6		Latitude	aggnodelat	Lat	Yes	deg min H	Latitude of the geolocation
7		Longitude	aggnodelong	Lon	Yes	deg min H	Longitude of the geolocation
8		Country State Long Name		A15	Yes		JOPES country/state long name
9		Area Responsibility Code		ORGCODE			JOPES area responsibility code identifying a unified or specified command
10		Army Location Code		A5			Army location code
11		Aggregated Node	aggnodeagg	A15			Aggregated node for export to a scenario database
12		Computed Node Deviation	aggnodedist	Short>=0		nmi	Computed great circle deviation distance from the detailed node to the aggregated node, in nautical miles

CCC Edit Limits JOPES Cargo Cat Code	Lists the three character JOPES cargo category codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Category Code		A3			JOPES three-character cargo category code describing cargo characteristics
2		Cargo Category Name		A15	Yes		Short cargo category name for use in GDAS
3		Major Category Label		MAJCAT	Yes		Major cargo category label corresponding to the first position of the JOPES cargo category code
4		Air Cargo Type Label		ACRGTYPE	Yes		Air cargo type label for this second position cargo category code
5		Unit Class Label		UNITCLAS	Yes		Unit equipment classification label (Ue, Ac, Nu) for this second position cargo category code
6		Containerizability Label		CNTRTYPE	Yes		Containerizability type corresponding to the third position of the cargo category code

Directory Type: Tpfdd

CCC JOPES Cargo Cat Code	Edit Limits	Lists the three character JOPES cargo category codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
7		Cargo Category Code 1		CCC1	Yes		First position of the JOPES cargo category defining the kind of cargo
8		Cargo Category Code 2		CCC2	Yes		Second position of the JOPES cargo category defining the air cargo type and the unit class
9		Cargo Category Code 3		CCC3	Yes		Third position of the JOPES cargo category defining cargo containerizability
10		Average Mton Per Ston		Double>=0		Mton/Ston	Computed average Mton per Ston ratio for this cargo category based on the TUCHA records in the TUCAT table
11		Average SqFt Per Ston		Double>=0		SqFt/Ston	Computed average SqFt per Ston ratio for this cargo category based on the TUCHA records in the TUCAT table
12		Average SqFt Per Mton		Double>=0		SqFt/Mton	Computed average SqFt per Mton ratio for this cargo category based on the TUCHA records in the TUCAT table
13		Description		A100			Description of the cargo category

CCC1 JOPES Cargo Cat Pos1	Edit Limits	Lists the first position of the JOPES cargo category code, which defines the kind of cargo

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Category Code 1		A1			First position of the JOPES cargo category code, defining the kind of cargo
2		Major Category Label		MAJCAT	Yes		Major cargo category label corresponding to the first position of the JOPES cargo category code
3		Description		A30			Description for the first position of the JOPES cargo category code

CCC2 JOPES Cargo Cat Pos2	Edit Limits	Lists the second position of the JOPES cargo category code, which defines the airlift cargo type and the unit class (Unit Equip, Acc Supply, Non Unit)

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Category Code 2		A1			Second position of the JOPES cargo category code, defining the air cargo type and the unit class
2		Air Cargo Type Label		ACRGTYPE	Yes		Air cargo type label for this second position cargo category code
3		Unit Class Label		UNITCLAS	Yes		Unit equipment classification label (Ue, Ac, Nu) for this second position cargo category code

CCC3 JOPES Cargo Cat Pos3	Edit Limits	Lists the third position of the JOPES cargo category code, which defines containerizability

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Category Code 3		A1			Third position of the JOPES cargo category code, defining the cargo containerizability
2		Containerizability Label		CNTRTYPE	Yes		Containerizability type corresponding to the third position of the cargo category code
3		Description		A35			Description for the third position of the JOPES cargo category code, defining the cargo containerizability
4		Max Length Inches		Short>=1	Yes	In	Maximum length in inches
5		Max Width Inches		Short>=1	Yes	In	Maximum width in inches
6		Max Height Inches		Short>=1	Yes	In	Maximum height in inches
7		Max Weight Ston		Short>=1	Yes	Ston	Maximum weight in short tons

CCC4 Custom Cargo Cat 4	Edit Limits	Lists a customizable fourth position cargo category code, which specifies user-definable cargo item dimensions

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Category Code 4		A10			Customizable cargo category code position 4 which defines dimension limits for detailed cargo items
2		Max Length Inches		Short>=1	Yes	In	Maximum length in inches
3		Max Width Inches		Short>=1	Yes	In	Maximum width in inches
4		Max Height Inches		Short>=1	Yes	In	Maximum height in inches
5		Max Weight Ston		Item Ston	Yes	Ston	Maximum weight in short tons
6		Description		A100			Description of the customizable cargo category code

CLASSIFC JOPES Classif Code	Edit Limits	Lists the JOPES security classification codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Security Classif Code		A1			JOPES security classification code
2		Security Classification		A12			JOPES security classification label

Directory Type: Tpfdd

CNTRTYPE Container Type	Edit Limits	Lists the containerizability types corresponding to the third position of the JOPES Cargo Category Code

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Containerizability Label		A4			Containerizability type corresponding to the third position of the cargo category code
2		Description		A35			Description of the containerizability type

CNTRYST JOPES Country State	Edit Limits	Lists the JOPES country state codes and names

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Country State Code		A2			JOPES country/state code
2		Country State Short Name		A5	Yes		JOPES country/state short name
3		Country State Long Name		A15	Yes		JOPES country/state long name
4		GSA State Code		A2			GSA state code
5		Navy Ocean Area Code		A2			Navy ocean area code, if any

CRGDTLVL JOPES Crg Detail Lev	Edit Limits	Lists the JOPES TUCHA and TPFDD cargo detail levels

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Level of Detail		A1			JOPES cargo detail level number for TUCHA and TPFDD data
2		TUCHA Record Type		A4			TUCHA record type code matching this level of detail
3		Cargo Level of Detail		A25			JOPES cargo detail level for TUCHA and TPFDD data
4		Description		A60			Description of the JOPES cargo detail level for TUCHA and TPFDD data

DATATEST Data Test Procedures Display Onl	Edit Limits	Lists the available data test and checking procedures for selection

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Test Type		A15			Type or applicability of the data test procedure
2	Y	Table		TABLE			Target table for the data test
3	Y	Data Test		A30			Data test or checking procedure name which is applied to the target table
4		Last Run Date		Date			Last run date for this data test or checking procedure
5		Test Severity		A20			Data test severity level
6		Description		A255			Description of this data test or checking procedure
7		Procedure		PAL			Procedure or query specification for this data test or checking procedure

DELREAS NonUnit Delay Reason	Edit Limits	Lists the JOPES codes for non-unit intermediate stop delay reasons

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Non Unit POI Delay Reason		A1			JOPES code for non-unit port of intermediate (POI) stop delay reason
2		Description		A40			Description of the non-unit intermediate stop delay reason

DELTYPE Unit Delay Type	Edit Limits	Lists the JOPES codes for unit intermediate stop delay type, either total force or force increments

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Unit POI Delay Type		A1			JOPES code for unit port of intermediate (POI) stop delay type, either total force or increments
2		Description		A60			Description of the unit intermediate stop delay type

DEPLOYIC JOPES Deploy Indic	Edit Limits	Lists the JOPES deployment indicator codes which characterize deployability

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Deployment Indicator Code		A1			JOPES deployment indicator code which characterizes deployability
2		Deployment Label		A20			Short label for the JOPES deployment indicator code which characterizes deployability
3		Description		A100			Description of the JOPES deployment indicator code which characterizes deployability

Directory Type: Tpfdd

DISCHCFG	Edit Limits	Lists the JOPES discharge constraint codes
JOPES Discharge Code		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Discharge Constraint Code		A2			JOPES discharge constraint code
2		Discharge Constraint		A50			JOPES discharge constraint

FIC	Edit Limits	Lists the JOPES force indicator codes
JOPES Force Indicate		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Force Indicator Code		0,9			JOPES force indicator code
2		Description		A70			Description of the force indicator code

FUELTYPE	Edit Limits	Lists the JOPES fuel types
Fuel Type Code		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Fuel Type Code		A3			JOPES fuel type code
2		Description		A50			Fuel type description or nomenclature

GEODATE	Edit Limits	Stores the geoloc file date
Geoloc Date		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Geoloc File Date		Date			Date of the last imported geoloc file

GEOLOC	Edit Limits	Stores the imported geoloc data from the JOPES Geofile
Geolocation		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Geoloc		A4			JOPES geoloc code for a geographic location
2		Geolocation Name		A17	Yes		Geolocation name
3		Installation Type Code		INSTTYPE	Yes		Installation type code which identifies the type of installation
4		Country State Code		CNTRYST	Yes		Country/state code which identifies the geo -political area or state
5		Country State Short Name		A5	Yes		Country/state short name
6		Province Code		A3			Province code identifying the political subdivision of the country or state
7		Province Name		A14			Province name identifying the political subdivision of the country or state
8		Tactical Zone		A2			Tactical zone code which identifies the military tactical zone
9		Latitude		Lat	Yes	deg min H	Latitude of the geolocation
10		Longitude		Lon	Yes	deg min H	Longitude of the geolocation
11		Logistic Planning Code		LOGCODE	Yes		Logistic planning code for military use
12		Prime Geoloc		GEOLOC	Yes		Prime geolocation code for grouping at a location
13		Record Owner		A6			Unit identification code (UIC) of the organization responsible for reporting the data on this record
14		ICAO		A4			International Civil Aviation Organization Code used to identify airports
15		GSA State Code		A2			General Services Administration (GSA) state code in the U.S.
16		GSA City Code		A4			General Services Administration (GSA) state city in the U.S.
17		GSA County Code		A3			General Services Administration (GSA) county code in the U.S.
18		Date Record Changed		Date	Yes		Date record was last changed
19		Date Record Created		Date	Yes		Date record was first created
20		Date Geoloc Cancelled		Date			Date this geoloc was cancelled
21		Country State Long Name		A15	Yes		Country/state long name
22		Area Responsibility Code		ORGCODE			JOPES area responsibility code identifying a unified or specified command
23		Record Status Code		A1			Record status code, A indicates active, C indicates cancelled
24		Security Classification		CLASSIFC			Security classification for this record
25		Army Location Code		A5			Army location code
26		Navy Ocean Area Code		A2			Navy ocean area code

HEAVLIFT	Edit Limits	Lists the JOPES heavy lift codes
JOPES Heavy Lift		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Heavy Lift Code		A1			JOPES heavy lift and dimension code
2		Length Max Inches		Short>=1	Yes	In	Maximum length dimension in inches for this heavy lift code
3		Weight Max Ston		Short>=1	Yes	Ston	Maximum weight in short tons for this heavy lift code

Directory Type: Tpfdd

IMPORT Import Specification	Edit Limits	Provides table, record, and field specifications for importing data from external databases

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Import Type		A15			Import type which corresponds to a single data file for importing
2	Y	Target Table		TABLE			Target table that receives the imported and translated data
3	Y	Record Variation		A15			Import name which specifies one type of import for the ASCII file
4	Y	Field Name		A25			Target field that receives the imported and translated data
5		Blanks Allowed?		A1			Yes if blanks are allowed, blank otherwise (should be blank for all key fields)
6		Updates Allowed?		A1			Yes if updates are allowed to existing records with matching key fields, no if original data is not to be changed
7		Start Column		Short>=0			Starting column in the input record for the ASCII characters to be translated
8		Stop Column		Short>=0			Stop column in the input record for the ASCII characters to be translated
9		Start Line		Short>=0			First line number in the ASCII file for this import type to process
10		Stop Line		Short>=0			Last line number in the ASCII file for this import type to process
11		Translation Name		A20			Translation name, if any, for converting the input ASCII string to an output datatype (blank means no translation performed; "@TABLENAME" indicates a table-driven translation; *FUNCTION means call a function)
12		Comment		A50			Comment, if any, describing this import record

INSTTYPE Installation Type	Edit Limits	Lists the JOPES Geolocation installation type codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Installation Type Code		A3			JOPES geolocation installation type code
2		Installation Type		A30			JOPES geolocation installation type

LOADCFG JOPES Load Config	Edit Limits	Lists the JOPES load configuration codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Load Configuration Code		A1			JOPES load configuration code
2		Load Configuration		A40			JOPES load configuration description

LOGCODE JOPES Logistics Code	Edit Limits	Lists the JOPES Geolocation logistics planning codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Logistics Planning Code		A2			JOPES geolocation logistics planning code
2		Description		A30			Description of the JOPES geolocation logistics planning code

MAJCAT Major Cargo Category	Edit Limits	Lists the major cargo categories corresponding to the first position of the JOPES cargo category code

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Major Category Label		A4			Major cargo category label corresponding to the first position of the JOPES cargo category code
2		Description		A30			Description of the major cargo category

MODECODE JOPES Move Type Code	Edit Limits	Lists the JOPES transport mode codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Mode Code		A1			JOPES transport mode code
2		Transport Mode		A15			Transport mode

MODE_SRC JOPES Mode & Source	Edit Limits	Lists the JOPES transport mode and source code combinations

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Transport Mode Code		MODECODE			Transport mode code
2	Y	Transport Source Code		TRANPSRC			Transport source providing organization code
3		Description		A100			Description of this transport mode and transportation providing organization

Directory Type: Tpfdd

MREQNODE Merged Req Node	Edit Limits Output	Lists detailed required intermediate POE or POD nodes or ports prior to aggregation for movement requirements having POE/POD nodes and modes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		MREQUIRE			Movement requirement identifier with intermediate ports or staging
2	Y	Cargo Class		A15			Cargo class for which the required node applies
3	Y	LAD		DayToHr		day (hr)	Latest arrival day at this required port node (the LAD is used to determine the order in which required nodes are visited)
4		EAD		DayToHr		day (hr)	Earliest arrival day at this required port node, if any
5		Required Node		A15AGGNODE	Yes		Required intermediate POE/POD node or port for this movement requirement
6		Required Mode to Node		A15AGGMODE			Required transport mode specified for delivery to the intermediate node, if any (blank permits the use of any mode for delivery)
7		Required Config to Node		A15			Required configuration specified for delivery to the intermediate node, if any (blank permits the use of any configuration)
8		Stage Name		A15			Staging deployment name if multiple requirements are staged together at this node (the STAGE record must have the same node as in REQNODE)
9		Description		A50			Description of this intermediate node, e.g. consolidation, container stuffing, mode change, re-configuration, combat loading, etc.

MREQQUAN Merged Req Quantity	Edit Limits Output	Provides detailed quantity data prior to aggregation for each movement requirement and cargo category for export to scenario directories

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		MREQUIRE			Requirement identifier for the cargo
2	Y	Cargo Category		A15AGGCAT			Cargo category which describes the kind of cargo being transported
3	Y	Cargo Measure		A15			Dimensional measure for this requirement and cargo category
4		Quantity		Double>=0	Yes	Q	Requirement category quantity or dimension in this unit of measure

MREQUIRE Merged Requirement	Edit Limits Output	Provides detailed information prior to aggregation for each movement requirement or package for export to scenario directories

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		A15			Movement requirement or package id
2		Major Unit		A20AGGMAJUN	Yes		Major unit associated with this movement requirement
3		Origin		A15AGGNODE	Yes		Starting origin of the requirement
4		Destination		A15AGGNODE	Yes		Final destination of the requirement
5		RLD		DayToHr		day (hr)	Ready to load day or earliest day the requirement is available at its origin
6		RDD		DayToHr		day (hr)	Required delivery day of the packaged requirement at its destination including time for assembly
7		EDD		DayToHr		day (hr)	Earliest allowed delivery day of the requirement at its destination prior to assembly
8		Computed Closure Day		DayToHr		day (hr)	Closure day for the requirement based on the closure minimum % requirement specified in the REQTYPE table
9		Priority Order		1,99			Relative priority order for this requirement as a secondary sort after the Target Lift Date (one means first priority in assigning lift assets, blank defaults to the priority order of the requirement type)
10		Aggregated Requirement Id		A15			Aggregated requirement identifier for export to a scenario database

NUMOVETP JOPES Non Unit Type	Edit Limits	Lists the JOPES non-unit type movement codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Non Unit Move Type Code		A1			Non-unit movement type code
2		Cargo or Pax		A5			Cargo or pax indicator for this non-unit movement type code
3		Movement Type Label		A13			Non-unit movement type label, also used as the default Aggregated Major Unit in AGGMAJUN for non-unit movements
4		Non Unit Movement Type		A40			Non-unit movement type

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NURECTYP Edit Limits Non Unit Record Type	Lists the JOPES TPFDD non-unit record types for Pax and Cargo

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Non Unit Cargo/Pax Code		A1			TPFDD non-unit record type code (G or J)
2		Non Unit Cargo/Pax		A10			TPFDD non-unit record type code (Cargo or Pax)

ORGCODE Edit Limits JOPES Organization	Lists the JOPES organization and service codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Organization Code		A1			JOPES organization or service code
2		Force Providing Org		A25			Force providing organization or service
3		Non Unit Cargo Prov Org		A25			Non-unit cargo providing organization or service
4		Non Unit Person Prov Org		A25			Non-unit personnel providing organization or service
5		Service or Using Org		A25			Using organization of service
6		OPLAN Id Min		A5			Minimum possible OPLAN identifier for this service or force organization
7		OPLAN Id Max		A5			Maximum possible OPLAN identifier for this service or force organization
8		ULN Force Id Min		A1			Minimum possible Unit Line Number (ULN) and force module identifier for this service or organization
9		ULN Force Id Max		A1			Maximum possible Unit Line Number (ULN) and force module identifier for this service or organization
10		CIN or PIN Min		A5			Minimum possible Cargo Item Number (CIN) or Personnel Item Number (PIN) assignment for this service or organization
11		CIN or PIN Max		A5			Maximum possible Cargo Item Number (CIN) or Personnel Item Number (PIN) assignment for this service or organization

PIC Edit Limits JOPES Parent Indicat	Lists the JOPES parent indicator codes which describe subordinate splitting

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Parent Indicator Code		A1			JOPES parent indicator code for describing subordinate splitting
2		Description		A25			Description for this parent indicator code for describing subordinate splitting

POILOC Edit Limits JOPES POI Location	Lists the JOPES intermediate port location codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	POI Location Order Code		A1			Port of intermediate debarkation (POI) location code
2		POI Location Order		A15			Intermediate port location description

RECCODE Edit Limits JOPES Record Indicat	Lists the JOPES record indicator codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Record Completion Code		A1			TUCHA record indicator code indicating F2 and F3 counts
2		Record Completion Status		A30			TUCHA record indicator code indicating F2 and F3 counts

STOPCODE Edit Limits JOPES Stop Code	Lists the JOPES stop reason codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Stop Code		A1			JOPES stop reason code
2		Stop Description		A15			JOPES stop reason description

SUPCLAS1 Edit Limits JOPES Supply Class 1	Lists the JOPES major supply class code in position 1

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Supply Class Code		A1			JOPES supply class major code which categorizes the kind of cargo
2		Supply Class Label		A20			Major supply class descriptive label
3		Description		A40			JOPES supply class major category

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SUPCLASS Edit Limits JOPES Supply Class	Lists the JOPES two-character supply class and subclass codes

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Supply Class/Subclass		A2			JOPES supply class and subclass code which categorize the kind of cargo
2		Supply Class Code		SUPCLAS1	Yes		JOPES supply class major code which categorizes the kind of cargo
3		Description		A50			Supply class and subclass description

TPID Edit Limits TPFDD Ident	Stores the imported TPFDD Identifier record

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	OPLAN		A5			Operations plan number
2		Force Record Count		Long>=0			Count of the total number of force or unit records in the TPFDD
3		Non Unit Record Count		Long>=0			Count of the total number of supply or non unit records in the TPFDD
4		Last Sector Address		Long>=0			Sector number of the last record in the TPFDD file

TPNONUNT Edit Limits TPFDD Non Unit	Stores the imported TPFDD Non Unit cargo and pax records

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	OPLAN		TPID			Operations plan number
2	Y	Movement Id		A7			Movement identifier consisting of the using organization, the movement type code, and the sequence number concatenated together
3		Using Organization		ORGCODE			Code identifying the service or activity that will use this nonunit related cargo or personnel
4		Movement Type Code		NUMOVETP			Movement code type that categorizes the functional use of the cargo/personnel
5		Sequence Number		Long>=0			Sequencing number that uniquely identifies this record with a using organization and movement type
6		Non Unit Cargo/Pax Code		NURECTYP			Record type
7		Origin Geoloc		GEOLOC	Yes		Origin geoloc code
8		Origin Country State		CNTRYST			Origin country/state code
9		POE Geoloc		GEOLOC			POE geoloc code
10		POE Country State		A2			POE country/state code
11		POE ALD		Short+/-		day	POE available to load date (ALD)
12		Computed POD EDD		Short+/-		day	The computed earliest delivery day (EDD) the unit could possibly arrive at the POD based on the POE ALD
13		POE Preferred Mode		MODE_SRC			Preferred mode of transport to the POE
14		POE Preferred Source		MODE_SRC			Preferred organizational source of transport to the POE
15		POE Alt Geoloc		GEOLOC			POE alternate geoloc code
16		POE Alt Country State		A2			POE alternate country/state
17		POD Geoloc		GEOLOC			POD geoloc code
18		POD Country State		CNTRYST			POD country/state code
19		POD EAD		Short+/-		day	POD earliest arrival date (EAD)
20		POD LAD		Short+/-		day	Latest arrival date (LAD) by which the requirement must arrive and complete unloading at the POD
21		POD Closure Day		Short+/-		day	POD feasible arrival date (FAD) by which the requirement completes unloading at the POD
22		POD Preferred Mode		MODE_SRC			Preferred mode of transport to the POD
23		POD Preferred Source		MODE_SRC			Preferred organizational source of transport to the POD
24		POD Alt Geoloc		GEOLOC			POD alternate geoloc code
25		POD Alt Country State		A2			POD alternate country/state
26		Dest Geoloc		GEOLOC	Yes		Destination geoloc code
27		Dest Country State		CNTRYST			Destination country/state code
28		Dest RDD		Short+/-	Yes	day	Required delivery day (RDD) by which the requirement must arrive and complete unloading at the destination
29		Dest Preferred Mode		MODE_SRC			Preferred mode of transport to the destination
30		Dest Preferred Source		MODE_SRC			Preferred organizational source of transport to the destination
31		Pax Needing Transport		Long>=0		Pax	Number of personnel requiring non-organic transport when this requirement moves
32		Cargo Category Code		CCC	Yes		JOPES three-character cargo category code describing cargo characteristics
33		Cargo Category Code 1		CCC1	Yes		First position of the JOPES cargo category code, defining the kind of cargo
34		Cargo Category Code 2		CCC2	Yes		Second position of the JOPES cargo category code, defining the air cargo type and the unit class
35		Cargo Category Code 3		CCC3	Yes		Third position of the JOPES cargo category code, defining the cargo containerizability
36		Heavy Lift Code		HEAVLIFT	Yes		Heavy lift category code corresponding to

TPNONUNT	Edit Limits	Stores the imported TPFDD Non Unit cargo and pax records
TPFDD Non Unit		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
							the heaviest item and the largest item dimension
37		Supply Class Code		SUPCLAS1			JOPES supply class major code which categorizes the kind of cargo
38		Supply Class/Subclass		SUPCLASS			JOPES supply class and subclass code which categorize the kind of cargo
39		Area SqFt		Double>=0	Yes	SqFt	Cargo area in square feet
40		Weight Ston		Double>=0	Yes	Ston	Cargo weight in short tons
41		Volume Mton		Double>=0	Yes	Mton	Cargo volume in measurement tons
42		Bulk POL Cbbl		Double>=0	Yes	CBbl	Cargo bulk petroleum, oil, and lubrication (POL) in hundreds of barrels
43		Project Code		A3			Project code used to identify special projects
44		Date Created		Date			Date this record was created
45		Date Last Changed		Date			Date this record was last changed
46		Providing Organization		ORGCODE			Providing organization or activity that is responsible for providing the cargo or personnel from this requirement
47		Fuel Type Code		FUELTYPE			Fuel type code
48		POI Reason		DELREAS			Reason for intermediate stop delay
49		POI Geoloc		GEOLOC			Port of intermediate (POI) location geoloc code
50		POI Country State		CNTRYST			Intermediate port country/state code
51		POI Preferred Mode		MODE_SRC			Preferred mode of transport to the intermediate location
52		POI Preferred Source		MODE_SRC			Preferred organizational source of transport to the intermediate location
53		POI Days Delay		Short>=0		day	Days delay at the intermediate location
54		POI Location Order Code		POILOC			Code describing the location of the intermediate port relative to the POE and POD
55		Description		A15			Description of this cargo or personnel increment

TPSRFCAT	Edit Limits	Stores the imported TPFDD SRF category records for non-standard units
TPFDD SRF Category		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	OPLAN		TPUNIT			Operations plan number
2	Y	Unit Line Number		TPUNIT			Concatenated force identifier or Unit Line Number (ULN) consisting of the force requirement number, fragmentation code, and insertion code
3	Y	Cargo Category Code		CCC			JOPES three-character cargo category code describing cargo characteristics
4		Cargo Category Code 1		CCC1	Yes		First position of the JOPES cargo category code, defining the kind of cargo
5		Cargo Category Code 2		CCC2	Yes		Second position of the JOPES cargo category code, defining the air cargo type and the unit class
6		Cargo Category Code 3		CCC3	Yes		Third position of the JOPES cargo category code, defining the cargo containerizability
7		Area SqFt		Double>=0	Yes	SqFt	Cargo area in square feet
8		Weight Ston		Double>=0	Yes	Ston	Cargo weight in short tons
9		Volume Mton		Double>=0	Yes	Mton	Cargo volume in measurement tons
10		Bulk POL Cbbl		Double>=0	Yes	CBbl	Cargo bulk petroleum, oil, and lubrication (POL) in hundreds of barrels
11		Heavy Lift Code		HEAVLIFT	Yes		Heavy lift category code corresponding to the heaviest item and the largest item dimension
12		Actual Detail Records		Short>=0			Actual number of detail records
13		Required Detail Records		Short>=0			Required number of detail records
14		Is Aggregated Flag		A1			Aggregation code, where 1 indicates that the cargo category quantities represent totals of the detail records
15		Date Last Changed		Date			Date this record was last changed

TPSRFDET	Edit Limits	Stores the imported TPFDD SRF detail records for non-standard units
TPFDD SRF Detail		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	OPLAN		TPSRFCAT			Operations plan number
2	Y	Unit Line Number		TPSRFCAT			Concatenated force identifier or Unit Line Number (ULN) consisting of the force requirement number, fragmentation code, and insertion code
3	Y	Cargo Category Code		TPSRFCAT			JOPES three character cargo category code defining the kind of cargo
4	Y	Record Id		Short>=0			Record identifier number or line number
5		Cargo Category Code 1		CCC1	Yes		First position of the JOPES cargo category code, defining the kind of cargo
6		Cargo Category Code 2		CCC2	Yes		Second position of the JOPES cargo category code, defining the air cargo type and the

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TPSRFDET	Edit Limits	Stores the imported TPFDD SRF detail records for non-standard units
TPFDD SRF Detail		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
							unit class
7		Cargo Category Code 3		CCC3		Yes	Third position of the JOPES cargo category code, defining the cargo containerizability
8		Cargo Description		A14			Equipment name or description
9		Length Inches		Short>=1		Yes In	Cargo length in inches of one piece of equipment described by this record
10		Width Inches		Short>=1		Yes In	Cargo width in inches of one piece of equipment described by this record
11		Height Inches		Short>=1		Yes In	Cargo height in inches of one piece of equipment described by this record
12		Area SqFt		Double>=0		Yes SqFt	Cargo area in square feet of one piece of equipment described by this record
13		Number of Pieces		Short>=1		Yes	Number of pieces of the item of equipment described by this record
14		Weight Ston		Item Ston		Yes Ston	Cargo weight in short tons of one piece of equipment described by this record
15		Volume Mton		Double>=0		Yes Mton	Cargo volume in measurement tons of one piece of equipment described by this record
16		Date Last Changed		Date			Date this record was last changed

TPSRFID	Edit Limits	Stores the imported TPFDD SRF identifier records for non-standard units
TPFDD SRF Ident		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	OPLAN		TPID			Operations plan number, which should match the OPLAN Number in the TPID table
2		OPLAN Date		A18			Date assigned to the OPLAN
3		OPLAN Classification		A19			Operations plan security classification
4		OPLAN Identification		A40			Operations plan identification
5		Task Organization		A50			Task organization for this OPLAN
6		Objective Area		A40			Primary objective area of this OPLAN
7		OPLAN Change Number		A2			Operations plan change number
8		Operations Concept		A255			Brief concept of operations for this OPLAN
9		Operations Concept More		A150			Continuation of the concept of operations for this OPLAN
10		First Available FRN		A3			First available force requirement number (FRN)
11		Last Available FRN		A3			Last available force requirement number (FRN)
12		Last Reserved FRN		A3			Last reserved force requirement number (FRN)
13		Agency FRN Ranges		A200			Force requirement numbers reserved for this OPLAN
14		Total Number SRF Records		Long>=0			Total number of Summary Reference File (SRF) records in this TPFDD
15		OPLAN Owner UIC		A6			Unit Identification Code (UIC) of the owner of the data in this OPLAN
16		Date Created		Date			Date this record was created
17		Date Last Changed		Date			Date this record was last changed
18		Force Select Counter		Long>=0			Force select counter which tracks the number of records created during building and maintenance
19		OPLAN TUCHA Date		A18			TUCHA date matching this OPLAN (often left blank, otherwise should match the date in the TUID table)

TPUNIT	Edit Limits	Stores the imported TPFDD standard force unit records
TPFDD Unit		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	OPLAN		TPID			Operations plan number
2	Y	Unit Line Number		A7			Concatenated force identifier or Unit Line Number (ULN) consisting of the force requirement number, fragmentation code, and insertion code
3		Force Requirement Number		A5		Yes	Force requirement number, part of the Unit Line Number
4		Force Fragmentation Code		A1			Fragmentation code, part of the Unit Line Number
5		Force Insertion Code		A1			Insertion code, part of the Unit Line Number
6		Providing Organization		ORGCODE			Providing organization or activity that is responsible for providing the cargo or personnel from this requirement
7		Service Code		ORGCODE		Yes	JOPES service code or organization
8		Unit Type Code		TUUTC		Yes	Unit type code, with the first position representing the functional area
9		Unit Type Function		UTCFUNCT		Yes	Unit type code first position which represents the functional area of the unit
10		Unit Level Code		ULC		Yes	Unit level code which categorizes the type of unit according to stratum, echelon, or control concentration
11		Force Description		A31		Yes	Force description

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TPUNIT TPFDD Unit	Edit Limits	Stores the imported TPFDD standard force unit records

#	K?	Field Name	Model Datatype	Domain	Lookup	B|V	Unit Meas	Description
12		TPSN or Other Force Desc		A5				Service specific force description code or Troop Program Sequence Number (TPSN) for the Army
13		Force Indicator Code		FIC		Yes		Force indicator code which defines whether this unit movement data is standard with TUCHA quantities or non-standard with SRF quantities
14		Parent Indicator Code		PIC				Parent indicator code which indicates whether the unit represents a parent, with or without subordinate splits
15		Unit Id Code		A6				Unit Identification Code (UIC) assigned as the actual unit to fill this force requirement
16		Unit Name		A30				Unit name assigned to fill this force requirement
17		Unit Source		A11				Unit source assigned to fill this force requirement
18		Project Code		A3				Project code used to identify special projects
19		Authorized Personnel		Long>=0			Pax	Authorized wartime strength or personnel
20		Pax Needing Transport		Long>=0			Pax	Number of personnel requiring non-organic transport when this requirement moves
21		Bulk Weight Ston		Double>=0		Yes	Ston	Bulk weight in short tons
22		Bulk Volume Mton		Double>=0		Yes	Mton	Bulk volume in measurement tons
23		Oversize Weight Ston		Double>=0		Yes	Ston	Oversize weight in short tons
24		Oversize Volume Mton		Double>=0		Yes	Mton	Oversize weight in short tons
25		Outsize Weight Ston		Double>=0		Yes	Ston	Outsize weight in short tons
26		Outsize Volume Mton		Double>=0		Yes	Mton	Outsize volume in measurement tons
27		NAT Weight Ston		Double>=0		Yes	Ston	Non air transportable cargo weight in short tons
28		NAT Volume Mton		Double>=0		Yes	Mton	Non air transportable cargo volume in measurement tons
29		Bulk POL Cbbl		Double>=0			Cbbl	Cargo bulk petroleum, oil, and lubrication (POL) in hundreds of barrels
30		Actual Cargo Categories		Short>=0				Actual number of cargo categories associated with the requirement
31		Required Cargo Categories		Short>=0				Required number of cargo categories associated with the requirement
32		Standard Force Desc Flag		A1				TUCHA status indicator for which a value of X indicates the force description is not to be changed by the TUCHA value
33		Origin Geoloc		GEOLOC		Yes		Origin geoloc code
34		Origin Country State		CNTRYST				Origin country/state code
35		Unit RLD		Short+/-			day	Unit ready to load day (RLD)
36		POE Geoloc		GEOLOC				POE geoloc code
37		POE Country State		A2				POE country/state code
38		POE ALD		Short+/-			day	POE available to load date (ALD)
39		Computed POD EDD		Short+/-			day	The computed earliest delivery day (EDD) the unit could possibly arrive at the POD based on the POE ALD
40		POE Preferred Mode		MODE_SRC				Preferred mode of transport to the POE
41		POE Preferred Source		MODE_SRC				Preferred organizational source of transport to the POE
42		POE Alt Geoloc		GEOLOC				POE alternate geoloc code
43		POE Alt Country State		A2				POE alternate country/state
44		POI Geoloc		GEOLOC				Port of intermediate (POI) location geoloc code
45		POI Country State		A2				Intermediate country/state
46		POI Preferred Mode		MODE_SRC				Preferred mode of transport to the intermediate location
47		POI Preferred Source		MODE_SRC				Preferred organizational source of transport to the intermediate location
48		POI Days Delay		Short>=0			day	Days delay at the intermediate location
49		POI Delay Type		DELTYPE				Intermediate delay type, with T indicating entire force delay at POI and F indicating incremental portions of the forces
50		POI Location Order Code		POILOC				Code describing the location of the intermediate port relative to the POE and POD
51		POI Load Configuration		LOADCFG				Intermediate load configuration
52		POI Discharge Constraint		DISCHCFG				Intermediate discharge constraint
53		POD Geoloc		GEOLOC				POD geoloc code
54		POD Country State		CNTRYST				POD country/state code
55		POD EAD		Short+/-			day	POD earliest arrival date (EAD)
56		POD LAD		Short+/-			day	Latest arrival date (LAD) by which the requirement must arrive and complete unloading at the POD
57		POD Closure Day		Short+/-			day	POD feasible arrival date (FAD) by which the requirement completes unloading at the POD
58		POD Projected Days Late		Short>=0			day	Projected days late at the POD
59		POD Preferred Mode		MODE_SRC				Preferred mode of transport to the POD
60		POD Preferred Source		MODE_SRC				Preferred organizational source of transport to the POD
61		POD Load Configuration		LOADCFG				POD load configuration

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TPUNIT	Edit Limits	Stores the imported TPFDD standard force unit records
TPFDD Unit		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
62		POD Discharge Constraint		DISCHCFG			POD discharge constraints
63		POD Alt Geoloc		GEOLOC			POD alternate geoloc code
64		POD Alt Country State		A2			POD alternate country/state
65		POD Arr Priority Sequence		Short>=0			Desired arrival priority sequence (001-999) for arrival at the POD
66		Priority Add On Sequence		A1			Priority add-on sequence to insert a unit into the desired arrival sequence
67		Dest Geoloc		GEOLOC		Yes	Destination geoloc code
68		Dest Country State		CNTRYST			Destination country/state code
69		Dest RDD		Short+/-		Yes day	Required delivery day (RDD) by which the requirement must arrive and complete unloading at the destination
70		Dest Preferred Mode		MODE_SRC			Preferred mode of transport to the destination
71		Dest Preferred Source		MODE_SRC			Preferred organizational source of transport to the destination
72		Dest Load Configuration		LOADCFG			Destination load configuration
73		Dest Discharge Constraint		DISCHCFG			Destination discharge constraint
74		Sea Support Geoloc		GEOLOC			Desired geoloc for delivery of nonunit general cargo by sealift
75		Sea Support Country State		A2			Desired country/state for delivery of nonunit general cargo by sealift
76		Air Support Geoloc		GEOLOC			Desired geoloc for delivery of nonunit general cargo by airlift
77		Air Support Country State		A2			Desired country/state for delivery of nonunit general cargo by airlift
78		POL Supply Geoloc		GEOLOC			Desired geoloc for delivery of nonunit POL
79		POL Supply Country State		A2			Desired country/state for delivery of nonunit POL
80		Ammo Supply Geoloc		GEOLOC			Desired geoloc for delivery of nonunit ammunition
81		Ammo Supply Country State		A2			Desired country/state for delivery of nonunit ammunition
82		FRG Force Select Number		Long>=0			Unique sequence number assigned to each force record
83		Date Created		Date			Date this record was created
84		Date Last Changed		Date			Date this record was last changed
85		Critical Employment Flag		A1			Critical employment indicator flag which is non-blank when the force is essential to the mission
86		CINC RDD		Short+/-		day	Required delivery date of the CINC at the destination
87		Gaining Command Code		A5			Gaining command code

TRANPSRC	Edit Limits	Lists the JOPES transport source providing organization codes (MSC, MTMC, etc.)
JOPES Trnsprt Source		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Transport Source Code		A1			Transportation source providing organization code
2		Transport Source		A15			Transportation source providing organization short name
3		Description		A100			Description of the transportation source providing organization

TRANSLAT	Edit Limits	Defines translations based on direct conversions, translation tables, or function mappings for importing data from external databases
Translation Table		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Translation Name		A20			Name of translation (reference Import table)
2	Y	Input Data		A25			Spec for input data
3		Translated Data		A25			Spec for translated data

TUCAT	Edit Limits	Stores the imported TUCHA F2 cargo category quantities for standard unit types
TUCHA F2 Category		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Unit Type Code		TUUTC			Unit type code, with the first position representing the functional area
2	Y	Cargo Category Code		CCC			JOPES three-character cargo category code describing cargo characteristics
3		Unit Type Function		UTCFUNCT		Yes	Unit type code first position which represents the functional area of the unit
4		Cargo Category Code 1		CCC1		Yes	First position of the JOPES cargo category code, defining the kind of cargo
5		Cargo Category Code 2		CCC2		Yes	Second position of the JOPES cargo category code, defining the air cargo type and the unit class
6		Cargo Category Code 3		CCC3		Yes	Third position of the JOPES cargo category code, defining the cargo containerizability
7		Security Classification		CLASSIFC			Security classification for this record

Directory Type: Tpfdd

TUCAT	Edit Limits	Stores the imported TUCHA F2 cargo category quantities for standard unit types
TUCHA F2 Category		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
8		Heavy Lift Code		HEAVLIFT	Yes		Heavy lift category code corresponding to the heaviest item and the largest item dimension
9		Is Aggregated Flag		A1			F2 aggregation code, where 1 indicates that the F2 cargo category quantities represent totals of the F3 detail records
10		Area SqFt		Double>=0	Yes	SqFt	Cargo square feet
11		Weight Ston		Double>=0	Yes	Ston	Cargo weight in short tons
12		Volume Mton		Double>=0	Yes	Mton	Cargo cube measurement tons
13		Bulk POL Cbbl		Double>=0		Cbbl	Cargo bulk petroleum, oil, and lubrication (POL) in hundreds of barrels
14		Required Detail Records		Short>=0			Required number of F3 detail records
15		Actual Detail Records		Short>=0			Actual number of F3 detail records

TUDATE	Edit Limits	Stores the imported TUCHA date
TUCHA Date		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	TUCHA Date		Date			TUCHA date, which is the date of last update

TUDET	Edit Limits	Stores the imported TUCHA F3 detail cargo quantities and dimensions for standard unit types
TUCHA F3 Detail		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Unit Type Code		TUCAT			Unit type code, with the first position representing the functional area
2	Y	Cargo Category Code		TUCAT			JOPES three character cargo category code defining the kind of cargo
3	Y	Record Id		Short>=0			Record identifier number or line number
4		Unit Type Function		UTCFUNCT	Yes		Unit type code first position which represents the functional area of the unit
5		Cargo Category Code 1		CCC1	Yes		First position of the JOPES cargo category code, defining the kind of cargo
6		Cargo Category Code 2		CCC2	Yes		Second position of the JOPES cargo category code, defining the air cargo type and the unit class
7		Cargo Category Code 3		CCC3	Yes		Third position of the JOPES cargo category code, defining the cargo containerizability
8		Security Classification		CLASSIFC			Security classification for this record
9		Cargo Description		A14			Equipment name or description
10		Length Inches		Short>=1	Yes	In	Cargo length in inches of one piece of equipment described by this record
11		Width Inches		Short>=1	Yes	In	Cargo width in inches of one piece of equipment described by this record
12		Height Inches		Short>=1	Yes	In	Cargo height in inches of one piece of equipment described by this record
13		Area SqFt		Short>=0	Yes	SqFt	Cargo area in square feet of one piece of equipment described by this record
14		Number of Pieces		Short>=1	Yes		Number of pieces of the item of equipment described by this record
15		Weight Ston		Item Ston	Yes	Ston	Cargo weight in short tons of one piece of equipment described by this record
16		Volume Mton		Double>=0	Yes	Mton	Cargo volume in measurement tons of one piece of equipment described by this record

TUOLDUTC	Edit Limits	Stores the imported TUCHA AB records containing updated UTC status, often cancelled
TUCHA AB Total		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Unit Type Code		A5			Unit type code having a status change (usually being cancelled), with the first position representing the functional area
2		Unit Type Function		UTCFUNCT	Yes		Unit type code first position which represents the functional area of the unit
3		Unit Level Code		ULC			Unit level code which categorizes the type of unit according to stratum, echelon, or control concentration
4		Deployment Indicator Code		DEPLOYIC			JOPES deployment indicator code which characterizes deployability
5		Service Code		ORGCODE	Yes		JOPES service code or organization
6		Security Classification		CLASSIFC			Security classification for this record
7		Unit Type Short Name		A15	Yes		Unit type short name
8		Unit Type Status		UNITSTAT	Yes		Unit type status code, where A indicates active, C indicates cancelled
9		Unit Type Name		A55	Yes		Unit type name
10		Originator Unit Id		A6			Originator's unit identification code (UIC)
11		Date Created		Date			Date this record was created
12		Date Last Changed		Date			Date this record was last changed
13		Authorized Personnel		Long>=0		Pax	Authorized wartime strength for personnel
14		Date Cancelled		Date			Date this record was cancelled
15		Reference Document		A19			Reference document that authorizes the type

Directory Type: Tpfdd

TUOLDUTC	Edit Limits	Stores the imported TUCHA AB records containing updated UTC status, often cancelled
TUCHA AB Total		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
							organization or contains its characteristics
16		UTC Replaced		A5			Replacement unit type code

TUUTC	Edit Limits	Stores the imported TUCHA ABF1 UTC records, including total air cargo type quantities
TUCHA UTCs and Air		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Unit Type Code		A5			Unit type code, with the first position representing the functional area
2		Unit Type Function		UTCFUNCT	Yes		Unit type code first position which represents the functional area of the unit
3		Unit Level Code		ULC	Yes		Unit level code which categorizes the type of unit according to stratum, echelon, or control concentration
4		Deployment Indicator Code		DEPLOYIC	Yes		JOPES deployment indicator code which characterizes deployability
5		Service Code		ORGCODE	Yes		JOPES service code or organization
6		Security Classification		CLASSIFC			Security classification for this record
7		Unit Type Short Name		A15	Yes		Unit type short name
8		Record Completion Code		RECCODE			Record completion indicator code
9		Unit Type Status		UNITSTAT			Unit type status code, where A indicates active, C indicates cancelled
10		F1 Security Classif		CLASSIFC			Security classification
11		Unit Type Name		A55	Yes		Unit type name
12		Originator Unit Id		A6			Originator's unit identification code (UIC)
13		Date Created		Date			Date this record was created
14		Date Last Changed		Date			Date this record was last changed
15		Authorized Personnel		Long>=0		Pax	Authorized wartime strength for personnel
16		Pax Needing Transport		Long>=0		Pax	Pax/non-organic transport
17		Required Cargo Categories		Short>=0			Required cargo categories
18		Actual Cargo Categories		Short>=0			Actual cargo categories
19		Reference Document		A19			Reference document that authorizes the type organization or contains its characteristics
20		UTC Replaced		A5			Replacement unit type code
21		Bulk Weight Ston		Double>=0	Yes	Ston	Bulk weight in short tons
22		Bulk Volume Mton		Double>=0	Yes	Mton	Bulk volume in measurement tons
23		Oversize Weight Ston		Double>=0	Yes	Ston	Oversize weight in short tons
24		Oversize Volume Mton		Double>=0	Yes	Mton	Oversize weight in short tons
25		Outsize Weight Ston		Double>=0	Yes	Ston	Outsize weight in short tons
26		Outsize Volume Mton		Double>=0	Yes	Mton	Outsize volume in measurement tons
27		NAT Weight Ston		Double>=0	Yes	Ston	Non air transportable cargo weight in short tons
28		NAT Volume Mton		Double>=0	Yes	Mton	Non air transportable cargo volume in measurement tons
29		Bulk POL Cbbl		Double>=0		Cbbl	Cargo bulk petroleum, oil, and lubrication (POL) in hundreds of barrels

ULC	Edit Limits	Lists the JOPES unit level codes
UNIT Level Code		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Unit Level Code		A3			Unit level code which categorizes the type of unit according to stratum, echelon, or control concentration
2		Description		A35			Unit level code description

UNITCLAS	Edit Limits	Lists the JOPES unit classifications (Unit Equip, Acc Supply, Organic)
JOPES Unit Class		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Unit Class Label		A2			Unit equipment classification short label (Ue,Ac,Nu) for the second position of the cargo category code
2		Unit Classification		A15			Unit equipment classification (Unit Equip, Acc Supply, Non Unit)

UNITSTAT	Edit Limits	Lists the JOPES unit status codes (active, canceled)
JOPES Unit Status		

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Unit Status Code		A1			Unit status code, where A indicates active, C indicates cancelled
2		Unit Status		A10			JOPES unit status description

Directory Type: Tpfdd

UPDATEDT Dictionary Update	Edit Limits Hide	Stores the latest update date for table structures in this directory

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Dictionary Update Date		Date			Latest date for updating the dictionary table structures using the UPDATE specifications

UTCFUNCT JOPES UTC Function	Edit Limits	Lists the JOPES Unit Type Code functional area which is the first position of the Unit Type Code

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	UTC Functional Code		A1			Unit Type Code (UTC) first position functional area code
2		Unit Functional Area		A18			Unit type functional area, also used as the default Major Unit aggregation in AGGMAJUN
3		Description		A50			Unit type functional area description

UTCSUBST UTC Substitution	Edit Limits	Lists the Unit Type Code substitutions for standard units that have no match in the TUCHA data

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	OPLAN		TPUNIT			Operations plan number
2	Y	Unit Line Number		TPUNIT			Concatenated force identifier or Unit Line Number (ULN) which has an unmatched Unit Type Code (UTC)
3		Substitute Unit Type Code		TUUTC			Substitute Unit Type Code which does have a match in the TUCHA TUUTC table

XREQNODE Export Req Node	Edit Limits Output	Lists aggregated required intermediate POE or POD nodes or ports for export to scenario directories

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		XREQUIRE			Movement requirement identifier with intermediate ports or staging
2	Y	Cargo Class		A15			Cargo class for which the required node applies
3	Y	LAD		DayToHr		day (hr)	Latest arrival day at this required port node (the LAD is used to determine the order in which required nodes are visited)
4		EAD		DayToHr		day (hr)	Earliest arrival day at this required port node, if any
5		Required Node		A15	Yes		Required intermediate POE/POD node or port for this movement requirement
6		Required Mode to Node		A15			Required transport mode specified for delivery to the intermediate node, if any (blank permits the use of any mode for delivery)
7		Required Config to Node		A15			Required configuration specified for delivery to the intermediate node, if any (blank permits the use of any configuration)
8		Stage Name		A15			Staging deployment name if multiple requirements are staged together at this node (the STAGE record must have the same node as in REQNODE)
9		Description		A50			Description of this intermediate node, e.g. consolidation, container stuffing, mode change, re-configuration, combat loading, etc.

XREQQUAN Export Req Quantity	Edit Limits Output	Provides aggregated quantity data for each movement requirement and cargo category for export to scenario directories

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		XREQUIRE			Requirement identifier for the cargo
2	Y	Cargo Category		A15			Cargo category which describes the kind of cargo being transported
3	Y	Cargo Measure		A15			Dimensional measure for this requirement and cargo category
4		Quantity		reqqn	Yes	Q	Requirement category quantity or dimension in this unit of measure

XREQUIRE Export Requirement	Edit Limits Output	Provides aggregated information about each movement requirement or package for export to scenario directories

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		A15			Movement requirement or package id
2		Major Unit		A20	Yes		Major unit associated with this movement requirement
3		Origin		A15	Yes		Starting origin of the requirement
4		Destination		A15	Yes		Final destination of the requirement
5		RLD		DayToHr		day (hr)	Ready to load day or earliest day the requirement is available at its origin

Directory Type: Tpfdd

XREQUIRE Export Requirement	Edit Limits Output	Provides aggregated information about each movement requirement or package for export to scenario directories

#	K?	Field Name	Model Datatype	Domain	Lookup	B	V	Unit Meas	Description
6		RDD		DayToHr				day (hr)	Required delivery day of the packaged requirement at its destination including time for assembly
7		EDD		DayToHr				day (hr)	Earliest allowed delivery day of the requirement at its destination prior to assembly
8		Computed Closure Day		DayToHr				day (hr)	Closure day for the requirement based on the closure minimum % requirement specified in the REQTYPE table
9		Priority Order		1,99					Relative priority order for this requirement as a secondary sort after the Target Lift Date (one means first priority in assigning lift assets, blank defaults to the priority order of the requirement type)

Directory Type: Model

CANDIDAT	Edit Limits	Lists candidate vehicle assignments sorted into heap order according to increasing cost/benefit ratio
Candidate	Model Only	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Candidate		Record# Vehic			Heap sort position or priority sequence order (first index is least)
2			heapcnd	CANDIDAT			Heap position for this vehicle or cargo scheduling candidate
3			cbratio	Long>=0			Vehicle cost/benefit ratio for cargo assignment, used to sort the heap

CMEASFUL	Edit Limits	Stores in the model the matching class measure record in CLASMEAS, if any, for every full combination of cargo class and measure
Class Measure Full	Model Only	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Class		CARGCLAS			Cargo class
2	Y	Measure		MEASURE			Measure
3			clasmeas	CLASMEAS			Matching cargo class/measure record in CLASMEAS, if any, for this cargo class and measure combination

CONVTHTR	Edit Limits	Lists which pairs of theaters have convoys
Convoy Theater	Model Only	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	From Theater		THEATER			From theater
2	Y	To Theater		THEATER			To theater
3		Has Convoy?	hascnvy	Boolean			Flag that is 1 if a convoy record travels between the theaters, 0 otherwise

CRGVTYPE	Edit Limits	Stores the first matching STOWPEN record in the model for feasible combinations of cargo type and vehicle type
CARGOxVehicle Types	Model Only	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Cargo Type		CARGTYPE			Cargo type which describes the kind of cargo being transported
2	Y	Vehicle Type		VEHTYPE			Vehicle Type
3			crgvstowpen	STOWPEN			First feasible Stowage Penalty record for this cargo type and vehicle type, or zero if the combination is infeasible

FACCAPHR	Edit Limits	Stores the remaining available capacity for each facility, capacity measure, and hour of operation (rebuilt each simulation day)
Facility Capacity Hr	Model Only	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Facility Node		Record# Vehic			Node with capacity constraints
2	Y	Facility Name		FACCAP			Facility with capacity constraints
3	Y	Facility Capacity Measure		FACCAP			Cargo storage or throughput capacity measure for this facility and/or node
4	Y	Operating Hour		0,24		hr	Operating hour at the facility or node
5		Remaining Hourly Capacity	faccaprem	Long>=0		Q	Remaining storage or throughput capacity for this measure and facility type for a single hour of operation

FACEVENT	Edit Limits	Stores all facility capacity events for the FACILITY table with capacities from the FACCAP table
Facility Capac Event	Model Only	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Capacity Event Number		Record# BigSt	Yes		Facility capacity event number
2		Capacity Event Time	capeventime	Long>=0	Yes	Hours	The time at which the facility capacity event occurs
3			firstcapremain	FACREM			The first matching record for multiple matching capacity remaining measures
4			nextcapevent	FACEVENT			List next pointer for the list of capacity events

FACREM	Edit Limits	Stores remaining capacities for multiple measures associated with each facility capacity event
Capacity Remaining	Model Only	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Capacity Remaining Number		Record# BigSt	Yes		Record number for the capacity remaining quantity
2		Capacity Remaining	capremain	Long>=0		Q	Facility event capacity remaining for a particular measure

FROMROUT	Edit Limits	Full table for routelists with key fields of From Node, Route Type, and Is Empty
From Node Route	Model Only	

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	From Node		NODE			From node for storing route list pointers
2	Y	Route Type		ROUTTYPE			Route type for storing route list pointers
3	Y	Vehcicle is Empty		Boolean			Empty vehicle indicator for distinguishing

Directory Type: Model

FROMROUT From Node Route	Edit Limits Model Only	Full table for routelists with key fields of From Node, Route Type, and Is Empty

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
							refueling route types
4			listroute	ROUTE			List pointer to a list of tonode routes of this type and fromnode

LNKEVENT Node Link Event	Edit Limits Model Only	Stores the usage events at links with constrained capacity

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Link Event Number		Record# BigSt			Link event number for link capacity events
2		Link Event Time	lnkevent_time	Long>=0			Time at which the link event occurs
3			firstlnkcapremain	LNKREM			The first in the group of remaining capacities for this link event
4			nextlnkevent	LNKEVENT			The next link event in the list of link events

LNKREM Link Capacity Remain	Edit Limits Model Only	Stores the remaining capacities for a link events in the various units of measure

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Link Remaining Number		Record# BigSt			Record number for indexing link capacity remaining amounts
2		Link Capacity Remaining	lnkremain	Long>=0			The amount of link capacity remaining for some link event

NODCAPHR Node Capacity Hr	Edit Limits Model Only	Stores the remaining available capacity for each node, capacity measure, and hour of operation (rebuilt each simulation day)

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Node Name		Record# Vehic			Node name with loading or unloading facilities
2	Y	Node Capacity Measure		NODECAP			Unit of measure for overall cargo handling capacity at the node
3	Y	Operating Hour		0,24		hr	Operating hour at the node
4		Remaining Hourly Capacity	nodecaprem	Long>=0		Q	Remaining throughput or storage for this measure and node for a single hour of operation

NODEVENT Node Capacity Event	Edit Limits Model Only	Stores all node capacity events for the NODE table with capacities from the NODECAP table

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Node Event Number		Record# BigSt	Yes		Node capacity event number
2		Node Event Time	nodeventime	Long>=0	Yes	Hours	The time the node capacity event occurs
3			firstnodremain	NODREM			The first matching remaining capacity record for multiple measures
4			nextnodevent	NODEVENT			List next pointer for the list of node capacity events

NODREM Node Cap Remaining	Edit Limits Model Only	Stores remaining capacities for multiple measures associated with each node capacity event

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Node Capacity Rem Id		Record# BigSt	Yes		Node capacity remaining record number
2		Node Capacity Remaining	nodremain	Long>=0		Q	The node remaining capacity for a given unit of measure

NODSTATE Node State	Edit Limits Model Only	Defines multiple dynamic programming states at each node, used in mode planning and routing with refueling

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	State Node		NODE			Node state number generated for port/mode/fleet/configuration planning using dynamic programming
2	Y	State Fleet		PLANFLT			Transport fleet associated with this state
3	Y	State Configuration		CARGCONF			Cargo configuration associated with this state
4			stpred	NODSTATE			Predecessor state in reaching this state
5			stpredlink	Short>=0			The link used to travel from the predessor state to the this state (in some cases this is a notional "convoy" link >NLINK)
6			stcost	Long>=0			Current cumulative cost of the state, including its lower bound to the destination
7			heapmodeplan	NODSTATE			Candidate queue of preferred states for processing in the state optimization algorithm
8			onmodeplanheap	Short>=0			Status indicator and pivot count for candidate states on the preferred/deferred queues in the state optimization algorithm

Directory Type: Model

NODSTATE Node State	Edit Limits Model Only	Defines multiple dynamic programming states at each node, used in mode planning and routing with refueling

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
9			sttime	Short>=0			Absolute time assigned to the state
10			state_vehfleet	VEHFLEET			The record in the VehFleet table, if any, which was used to move the cargo to this state
11			state_poestate	NODSTATE			The nodstate record representing the poe for this vehfleet movement
12			state_pfdelay	Short>=0			The delay due to planning fleet capacity due to this transition

PFLEVENT Fleet Event	Edit Limits Model Only	Lists the fleet capacity events

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Fleet Event Number		Record# BigSt			A number to provide a key for this table
2		Fleet Event Time	fleventime	Long>=0			The time the event occurs
3			firstfleetrem	PLNFLTRM			First in the group of fleett capacity remaining records for this event
4			nextflevent	PFLEVENT			Next pointer for the list of fleet events

PLNFLTRM Plan Fleet Cap Rem	Edit Limits Model Only	Lists the capacities remaining for associated fleet events

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Fleet Remaining Number		Record# BigSt			Fleet capacity remaining record number
2		Fleet Capacity Remaining	fleetcaprem	Long>=0			The amount of fleet capacity remaining

POEFAC POE Plan Facility	Edit Limits Model Only	Stores poe facilities used by each fleet and configuration combination

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	POE Fleet		PLANFLT			Planning fleet used to move from a POE node during planning
2	Y	POE Config		CARGCONF			Cargo configuration carried by the fleet
3			poefac	FACILITY			Facility used by the fleet and configuration combination (the extra record NFACILITY+1 is specified if facility is undetermined)
4			poevehdata	VEHDATA			Matching record in the VehData table used at the POE in planning
5			poevehfleet	VEHFLEET			Matching record in the VehFleet table used at the POE in planning
6			poedelay	HoursDelay			Delay occuring at the facility for the cargo using this fleet and configuration
7			data_is_current	Boolean			Flag to mark that the poefac data is current

REQCAT Requirement Category	Edit Limits Model Only	Each record has information about a requirement and cargocategory that doesn't depend on measure.

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Requirement Id		Record# BigSt			The requirement identifier
2	Y	Cargo Category	reqcat	CARGOCAT			A cargo category associated with this requirement
3			reqqntot	Long>=0		Q	The total amount of cargo for this category in its basic unit of measure
4			firstreqcatquan	REQQUAN			First requirement quantity for this requirement and category pair

ROUTECAP Route Capacity	Edit Limits Model Only	Lists the capacitated link used by each route

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	From Node		Record# BigSt			Route from node
2	Y	To Node		ROUTE			Route to node
3	Y	Route Type		ROUTE			Route type
4	Y	Vehicle Is Empty		ROUTE			Flag for empty versus loaded travel
5	Y	Link Capacity From Node	routecap_link	NODELINK			From node of the matching capacitated link used by this route
6	Y	Link Capacity To Node		NODELINK			To node of the matching capacitated link used by this route
7	Y	Link Capacity Mode		NODELINK			Transport mode of the matching capacitated link used by this route
8		Route Cap Offset	routecap_offset	Long>=0		nmi	Distance to the end of the route or to the next capacitated link, in nautical miles

Directory Type: Model

RTSTATE Routing Node State	Edit Limits Model Only	Stores dynamic programming states for shortest path routing

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Route State		Record# BigSt	Yes		Routing node number but can be extended to include post-destination refueling recovery bases
2			rtcost	Long>=0			Cumulative cost plus lower bound of achieving this state
3			rtpred	RTSTATE			Predecessor state in reaching this state
4			rtpredlink	Short>=0			The link used to travel from the predecessor state to this state
5			heaproute	RTSTATE			Priority queue of routing states for the dynamic programming algorithm
6			onrouteheap	Short>=0			On queue status index for this routing state
7			rtrange	Long>=0			Cumulative distance since the last refueling

UNITMEAS Major Unit Measure	Edit Limits Model Only	Lists whether a major unit has requirement quantities using a reporting measure

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Major Unit		MAJUNIT			Major unit
2	Y	Cargo Measure		RPTMEAS			Cargo quantity measure (ston, pax, cbbl, mton, sq ft)
3		Is Major Unit Measure?	ismajunitmeas	Yesflag			Flag set to True if the major unit has requirement quantities which utilize this reporting measure

VCPTFULL Veh Cpt Type Full	Edit Limits Model Only	Stores in the model the first matching compartment/measure in VCPTMEAS, if any, for each full combination of vehicle type and compartment type

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle Type		VEHTYPE			Vehicle Type
2	Y	Compartment Type		CPTTYPE			Name of an available compartment type for the vehicle type
3			vcptmeas	VCPTMEAS			First matching compartment/measure record in VCPTMEAS, if any, for this vehicle/compartment type (zero if the compartment type does not exist on this vehicle type)

VCPTMEAS Veh Cpt Meas Full	Edit Limits Model Only	Accumulates compartment measure quantities for a single vehicle during route insertion in the model (also tracks total vehicle tonnage in the extra dummy record)

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Vehicle/Cpt/Meas Number		Record# VehCp			Compartment/measure record number for a single vehicle
2		Vehicle Type		VCPTTYPE			Vehicle type for the current vehicle
3		Compartment Type		VCPTTYPE			Vehicle compartment type for the current vehicle
4		Compartment Measure		MEASURE			Compartment measure
5			cptcurqn	Long>=0		Q	Running total of the compartment measure quantity after leaving the predecessor stop on its way to the insertion stop (extra record is used for total vehicle capacity, so cannot size by vcptcap alone)
6			cptmaxqn	Long>=0		Q	Maximum compartment load encountered on vehicle during insertion of a new cargo
7			cptpoeqn	Long>=0		Q	Total of the vehicle compartment load prior to the inserted POE stop (used to try later on POE insertion)
8			cptpoemaxqn	Long>=0		Q	Max compartment load encountered prior to the inserted POE stop (used to try later on POE insertion)
9			cptcap	Long>=0		Q	Capacity of the vehicle compartment in this measure

Directory Type: Reference

CLASSIF Classification	Edit Limits	Lists the various security classification levels

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Security Classification		A12			Classification level
2		Security Classif Code		A1			Classification abbreviation

MAPCOLOR Mapping Colors	Edit Limits	Lists the available colors for mapping objects (shapes and lines)

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Color		A15			Name of the color for mapping
2		Red Intensity		Byte>=0	Yes		Red intensity for the color
3		Green Intensity		Byte>=0	Yes		Green intensity for the color
4		Blue Intensity		Byte>=0	Yes		Blue intensity for the color

MAPFILE Map File Paths	Edit Limits	Lists the world map file paths

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Map Name		A20			Short name for the world map
2		Map Drive		A1			Drive letter for the map data (may be a CDROM), updates the workspace file if changed
3		Map Workspace File		A50		Yes	Full path or path relative to Mapapp for the world map .wor workspace startup file, usually in Mapapp and not on the map drive itself
4		Description		A50		Yes	Description of the world map
5		Application Title		A50		Yes	Title displayed at the top of the application window as a whole
6		Map Window Title		A50		Yes	Title for the world map window within the application window
7		Map Browse Table		A50			Full or relative path without drive letter to a general map browse table (MapInfo *.tab file) located on the map data drive, blank if none

MAPFONT Mapping Fonts	Edit Limits	Lists the available fonts for mapping labels

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Font Name		A50			Windows Font (or MapInfo Helvitica, Courier, Times)

MAPFSTYL Mapping Font Styles	Edit Limits	Lists the font styles for mapping labels

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Font Style		A25			Name of Font style
2		Style Value		Short>=0	Yes		MapInfo value for this Font style

MAPLINE Mapping Line Types	Edit Limits Constant No	Lists the available line symbols for map links

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Line		A25			A line type
2		Line Value		Byte>=0			The MapInfo numeric value for this line type

MAPSHAPE Mapping Shape Types	Edit Limits	Lists the available shape symbols for map nodes using installed Windows fonts

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Shape		A25			A shape type
2		Character Value		Byte>=0			The MapInfo numeric value for this symbol shape
3		Font Name		MAPFONT	Yes		The font name of a symbol shape
4		Font Style		MAPFSTYL	Yes		The font style for this symbol shape and character value

MAPTYPE Mapping Table Types	Edit Limits Constant No	Lists the fundamental mapping table types (Node or Link)

#	K?	Field Name	Model Datatype	Domain|Lookup	B|V	Unit Meas	Description
1	Y	Map Type		A10			Available mapping display types